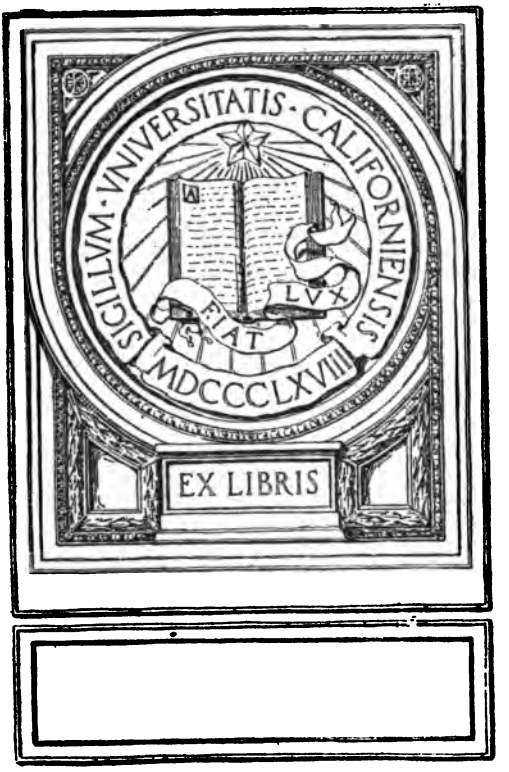

ORGANIZATION
IN
ACCIDENT PREVENTION

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BY

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PREFACE

Success in organizing accident prevention work at the present time, depends upon minimizing labor turnover, upon the personality of the safety engineer in charge, upon the kind of educational work conducted, and upon the personal interest which this work is able to arouse in the average employee. Educational work should be carried on systematically and should be adaptable to changing work conditions. When production is heavy, when many new employees are being hired, when epidemics of sickness exist, and weather conditions are severe, when employees have become accustomed to bulletin boards, moving-pictures and safety literature of all sorts, and enthusiasm has waned, the safety engineer is confronted with a difficult situation. When this time arrives, if the safety man familiar with the educational methods of other companies, changes his methods, using new ideas obtained at safety conventions, puts new people on committees, institutes new, original ways of presenting his facts, he will find his enthusiasm return and results will follow. An occasional vacation is a vital factor in restoring enthusiasm.

The following volume has been prepared covering successful educational experiences in organizing safety work. The writer's experience as an educator has been an important asset in maintaining enthusiasm, and in instituting many of the methods described in this text. It is hoped that the data presented will be helpful to others and will result in further spreading the gospel of safety. The writer appreciates the co-operation of the American Iron and Steel Institute, "Machinery," United States Steel Corporation, National Association of Corporation Schools, National Safety Council, and the General Electric Company for the use of illustrations in this text.

SYDNEY W. ASHE.

April 1, 1917.

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ORGANIZATION IN ACCIDENT PREVENTION

CHAPTER I

FELLOWSHIP—SYSTEM—EDUCATION—DISCIPLINE

Introduction.—Safety is a habit and psychologists tell us that habits are formed through paths of least resistance bringing the greatest momentary satisfaction.

The safety habit—cautiousness—comes from frequent realization of consequences of dangers avoided. A cautious person is seldom injured; when such is injured it is usually the result of some distracting circumstance, lack of concentration on the task immediately in hand. A cautious individual will seldom invite danger, will avoid chances, cannot be tempted into recklessness, and always involuntarily visualizes the consequence of an accident before taking a risk. For this reason education is the most effective medium of developing habits of caution.

Safeguards are of value in avoiding accidents, because of the mental sluggishness which comes from frequent repetition of any fixed operation. Leave a guard off for a time and notice how quickly an accident happens to the operator accustomed to the guard. The writer has in mind two accidents which happened within a comparatively short space of time in which the injured were caught in gears, the guards not having been replaced after making repairs, whereas prior to the gears being protected they had been exposed for several years without a resulting accident.

"The accident prevention problem involves two essential elements—safeguarding and education, in each of which there is more or less detail work. Experience in the past decade has conclusively proven that safeguarding and educational work in any plant is not a 'one man

job:' that satisfactory results can only be secured through the highest measure of coöperation between the employer and his employees, and this only by means of organization. The employer himself must be vitally interested in the work if he expects to educate his men to share the responsibility with him. The men must be given a part to perform in it, if their interest is to be aroused and maintained. The problem must touch them somewhere, and they must be brought into direct relationship with their employer. It is only through organization that this is possible."

R. W. CAMPWELL, *Past President*,
National Council for Industrial Safety.

In instituting accident prevention work, it is important to know what distribution of expense is proper for safeguards versus safety educational work. Both are necessary and opinions differ as to their relative effectiveness. On the theory that the average mechanic or workman seldom sticks to a single task for any appreciable time, it becomes necessary to work out some general policy of developing the "safety habit." This can best be accomplished through educational means.

Another factor that must be considered is the relative importance of bonuses versus discipline as accident preventives. Some companies have obtained effective results with the bonus system and prizes, while others have taken it for granted that they expect their employees to be cautious and discourage the employment of those who are careless. An effective system of reporting accidents, plotting ratio curves showing the relative department safety records, making the men feel that caution is an important part of their work, or keeping close watch of the accident situation, seems, automatically, to reduce accidents about 50 per cent.; whether the increased attention of some executive in charge creates greater individual attention in the employees to the task in hand, or whether it is the fear of a reprimand, it is difficult to say, but the fact remains that in practically all cases where accidents are being watched and studied in our industries, progress is being made in their reduction. While in practically all cases the motive that governs safety work is humanitarian, still the financial

Special prone pressure demonstration for girls by welfare nurse—Pittsfield Works, General Electric Company.

and moral gain, and the gain in permanent efficiency, compensates to a large degree for any expenditure of time, effort, or money, which may be made.

Imagine the moral effect on the public of a large railway system which can state authoritatively that during the past five years not one passenger was killed. This is the record of the Southern Pacific Railroad Company.

Many companies in America, in instituting safety work, have followed implicitly the methods used with such success in foreign countries, such as Germany, in guarding all points of danger, hoping by this means to obtain equal success. Not realizing the fact that, in a country like Germany with its military training, its similarity of population, its sureness and thoroughness of operations of the workingmen, its systematization, conditions are entirely different from what they are in this country, they have not been able to obtain the same measure of success. This point is well illustrated by the following abstract from *Technical Paper* No. 30 of the Department of Interior, Bureau of Mines, by Dwight E. Woodbridge, on "Mine Accident Prevention at Lake Superior Iron Mines:"

Effect of Safety Precautions on Number of Accidents

"Although it is quite probable that present standards would demand a larger number of safety devices than in the past, and would require the company to exercise more care than formerly, one must still conclude that the installation of these devices, while of undoubted importance, does not reduce the number of accidents to the extent commonly supposed. There are other elements that must be given the most careful consideration. Of these, the chief is the education of the workingmen to a sense of interdependence and individual responsibility."

Mr. Robert J. Young, Chief of the Safety Department of the Illinois Steel Company, quotes as follows in connection with the value of educational methods for accident reduction:

"The question has been asked as to what efficiency in accident reduction can be acquired by guarding dangerous places. After going

into the matter very carefully, I am led to believe that not more than 33⅓ per cent. of efficiency can be gained by guarding machines and in connection with this you will have the incidental advertising of safety that comes with the installation of the guards. Usually this efficiency will fall below 25 per cent.

"In talking with the United States Government expert in accident prevention, I asked this question. He placed the guarding of machines (not taking into consideration the incidental advertising of safety thereby) at not greater than 10 per cent. You will see, therefore, that if you are going to make a material reduction in your accident rate, it must be done largely through inspection and education."

The First Aid Department of the American Red Cross, under the direction of Major Robert U. Patterson, U. S. Army, and his associates, has done splendid educational work along preventive lines and first aid. A large number of classes on first aid to the injured have been carried on throughout this country under their supervision.

Dr. William H. Tolman of the American Museum of Safety, with the coöperation of the Brooklyn Rapid Transit Company and the Board of Education of the City of New York, has trained thousands of school children in safety methods. If this work is started in other cities as it has been in New York and continued for a few years, there is no question as to the wonderful benefit that will accrue to our people and to our industries as a whole.

Many of our railroads, Y. M. C. A.'s, manufacturing companies, etc., have started first aid classes, realizing the great importance of educational work along preventive lines. In carrying on educational work on accident prevention, we should not lose sight of two important things: (1) Carrying the work on continuously; and (2) the necessity of repetition.

Mr. Paul Lupke, in a paper on "Safety First" before the National Electric Light Association, dwelt upon this latter point in the two following important abstracts:

"Newspaper men and other publishers and writers know that the people do not learn facts and arguments on any subject by one announcement, and that it needs constant effort of iteration and reiteration to send the matter home to the people it is wished to reach."[1]

[1] Professor William Howard Taft.

"The greatest factor operating toward the prevention of accidents is not the prevention device but the 'prevention spirit'."[1]

Dr. M. J. Shields of American Red Cross Society giving first aid demonstration during noon hour. First aid car in background.

If we all realized in safety work that each employee is a human being with a human interest, has his family and

[1] *Power.*

home, no matter how humble his position may be, is usually ambitious and has a natural interest in his work and in the community, reads his daily paper, etc., in other words, likes to live—we would see quickly that it is possible to obtain the coöperation of this individual in developing the safety habit, providing we use educational means and choose the right methods. Habits of safety instilled into the minds of working people ultimately find their way into improved quality of goods manufactured or service performed.

Prize safety-first fob.

Get the safety habit is a good slogan and to get this habit we must have our men accustomed to safe conditions, to using safe tools, to eliminating chances, to removing sources of danger; they must be interested in having the best departmental safety record, be willing to obey safety instructions, and, finally, be on the job when anything goes wrong.

The reason loose habits are formed is that we normally follow the lines of least resistance and choose a path that brings the greatest momentary satisfaction. The reason a chance is taken and an accident results many times is, therefore, due to a mental feeling of unwillingness at this instant to use the extra effort to do what is right. To overcome this feeling of mental inertia we must, therefore, visualize in the individual at this particular instant a picture of the consequence of the accident if the chance is taken. To have this condition brought about, the person about to take the chance must know of the danger and must have the safety habit. This habit can be readily developed by continuous safety educational work.

While many of the larger manufacturing and public utility companies have instituted safety measures, a num-

ber of the smaller companies have done little in this direction. In many places, dark passageways in need of efficient lighting are prevalent, besides utter lack of safety measures. Means for caring for injured and lack of any form of safety educational work is also apparent. If these companies would only realize how much it is within their power to accomplish in safety work with comparatively little expense,

Lackawanna Steel Company, Buffalo, N. Y. Notice pasted in drafting-room instructing engineers and draftsmen to provide for adequate guards and other safety devices on all plans and drawings.

the country's yearly accident rate would be considerably reduced. Many excellent safety publications, which will give beginners in safety work many valuable suggestions, are issued by various companies, and may be obtained free.

Fellowship.—Fellowship, system, education and discipline are the four necessary elements in safety and health work. In carrying on any educational course of safety and health, these elements must be considered separately and

individually, as each element has a direct bearing on the ultimate desired result; namely, to decrease accidents, to improve conditions of health in industry, and to increase efficiency through educational means. Before outlining a suitable educational course in safety and health, it is first necessary to study and systematize the accident data of any particular company. These data, when systematized, will not only be suggestive in laying out an educational scheme, but will also be useful in later years for comparative purposes. Educational work, to be received properly, to be appreciated, and to have the right kind of coöperation given, must also have a proper spirit of fellowship existing in the company. While educational safety work may do much to stimulate fellowship where it exists in a moderate degree, still if it has previously been stimulated by other methods, it will help greatly in obtaining the proper response to safety work. Having established an educational course in safety and health, the work should be carried on systematically as part of the company's regular educational work, centralized under the supervision of some specific department, such as the Welfare, Educational or Safety Department, similar to the practice now followed in industry with apprentice courses, special apprentice courses, and sales training courses. In other words, a definite schedule should exist and be adhered to. When the educational work has been in force for a time and everyone has become interested and instructed in safety first methods, if it is found that employees are habitually careless, for their own good they should be encouraged to seek other forms of employment less hazardous. Discipline, however, should not be exercised until all other means have failed; and even then with due allowance for unusual conditions, such as the newness of an employee, unfamiliarity with rules, regulations and operations, troubles at home, sickness, unusually severe weather conditions, and other unusual factors which might be responsible for lack of alertness. Usually it will be found that an occasional request for greater coöperation in safety work or increased caution,

Pickands, Mather and Company, Cleveland, Ohio. Company's ambulance at mines at Palatka, Mich.

Pickands, Mather and Company, Cleveland, Ohio. Method of handling man in Stokes splint stretcher with which it is possible to carry him safely through the very small and intricate workings of mines.

Oliver Iron Mining Company, subsidiary of United States Steel Corporation. Some of the standard warning and danger signs; the black circles in the cut are red in the original.

Oliver Iron Mining Company, subsidiary of United States Steel Corporation. The mine rescue crew, taken after fighting a fire in the Tilden mine.

coming from the management, will accomplish the desired result.

In many large corporations we find the element of fellowship highly developed. There is a close relationship in the idea contained in the words "coöperation" and "corporation." One is defined as the act of operating jointly with another to the same end. Corporation is defined as a body politic, organized to operate as a single person. Andrew Carnegie, in the early days of steel-making, tied a broomstick to the smokestack of the rolling mill that had the greatest monthly output. It worked wonders as a stimulus to human endeavor. Carnegie understood human nature—the ability of people to work together, to pull together under the proper stimulus of fellowship due to sympathetic and just leadership. The greatest progress in safety work will be found in those places where systematic educational safety work is carried on, where the right spirit of fellowship exists, and where the manager and the workmen at the bench feel that they are fellow-employees. There must be respect for superiors and discipline, but at the same time, there should be that friendly confidence or mutuality of interests based on Kelvin's law of economic balance. In designing a transmission line, the most economic condition is that in which the interest on the capital invested is equal to the cost of energy dissipated. This is known as Kelvin's law. It applies to human endeavor as well as to engineering. The most efficient work in safety and health is that in which the employer and employee are mutually interested. The manager, through the resources of his company and through his position, is able to extend to the employee many perquisites which an employee, working as a single individual, could not benefit by, but which the company can extend at small expense. The company's facilities for organization, accounting, purchasing, publicity, education, etc., can be placed at the disposal of employees through their Welfare Department, or through employees' clubs, to help any activity which may be started for the benefit of the

National Tube Company, Lorain works, subsidiary of United States Steel Corporation.

Youngstown Sheet and Tube Company. Sign at entrance to rod and wire plant—the daily safety reminder. This sign is printed also in foreign languages spoken in the plant, and is changed weekly.

American Rolling Mill Company, Middletown, Ohio. First aid medical cabinet in foreman's office, galvanizing department.

American Rolling Mill Company, Middletown, Ohio. First aid team with kits.

employee. This is the method which many companies use to stimulate fellowship. All of these activities, however, should be founded on sound economic principles; and while many times it takes time to get the activities in this condition, they never become permanent activities until this stage has been reached. In other words, it does not pay to throw away money in welfare work for its mere advertising value—activities should be self-supporting when possible, as employees resent charity.

System.—It is important, as previously stated, in safety work, that a definite plan should be followed in maintaining safety educational work. In starting such work it is well to secure someone, experienced in teaching, who can devote a reasonable amount of time to this work. This individual should make a study of safety devices, first aid work, all methods of resuscitation, tuberculosis, sanitary conditions, and should be able to systematize and classify all accidents which occur, with their causes. From this data it will be found that certain large groups of certain classes of accidents exist, differing with each industry, and these particular groups are the ones upon which concentrated effort should first be made. It will be found in manufacturing, for instance, that eye cases, strains, and ruptures, foot burns in the foundry, falls and other injury to repair men, or men engaged in construction work, form the most prevalent sources of accidents.

Education.—Assuming that a suitable instructor has been found to carry on the educational safety work, and that this instructor has studied the accident conditions at the local plant and has become familiar with the safety literature issued by the National Safety Council, the American Museum of Safety, the Travelers' Insurance Company, the Aetna Insurance Company, and many of our large manufacturing or operating companies, such as the Norton Grinding Wheel Company, United States Steel Corporation, Carnegie Steel Company, General Electric Company, Commonwealth Edison Company of Chicago, Commonwealth Steel Company, Westinghouse Electric

& Manufacturing Company, The Great Northern Railroad, Santa Fe System, Brooklyn Rapid Transit Company, and many other companies that could be mentioned that have made splendid progress in safety educational work, it becomes the duty of this instructor to outline some definite course to follow. It is suggested that this course be not too extensive, a series of lectures, like the following, being ample:

1. The principal types of accidents occurring in the local plant—their causes and remedies.
2. First aid to the injured, including the use of the first aid kit and the making of tourniquets.
3. The prone pressure method of resuscitation with demonstrations.
4. Tuberculosis.
5. Fire hazards.
6. Methods of reporting accidents and the use of standard safety devices.

These lectures should first be given to a selected group of men, consisting of foremen, assistant foremen, and gang bosses, including every department in the organization, with the exception, possibly, of the office force. Everyone should be given an opportunity to demonstrate, and the lectures should be repeated at monthly intervals until this entire group of men has been thoroughly trained. For an organization employing 5,000 people, 200 "first aid minute men" are none too many. These lectures should be supplemented by a works' paper published at monthly intervals, going to all the employees in the organization, distributed free. In this paper the material which is presented in the lectures, should be worked up with illustrations for the benefit of every employee in the organization. If the publication is well illustrated, and contains in addition to safety material, matters of general interest, including personal achievements, historical sketches, useful tables, it will be found that great interest will be aroused on the part of the employees, in safety work. This paper should be edited by the same individual that gives the lectures,

Training foreigners in the correct use of goggles—Illinois Steel Company, subsidiary of United States Steel Corporation.

so that the general educational work will bear a direct relation to the specific lectures given. In distributing this paper, it is well to have it appear on a definite day each month, such as the first of the month, the circulation taking place at certain specific centers. Some idea of the interest which may be aroused in such a paper can be gained, when it is stated that the Pittsfield works has distributed 5,000 copies of such a sheet each month for the past three years and only about twenty loose copies have been found during this time about the streets or about the works after the distributions have been made. This paper is distributed in such a way that the copies are taken home where they are read by the other members of the family. The third phase of the educational work which is also important, is to include the public in the safety work which is carried on. This can readily be accomplished by giving first aid lectures, throughout the school system, to Boy Scout groups, to the Y. M. C. A., to churches and wherever an opportunity occurs; for it must be realized that if we can get the teachers, the pupils, and the mothers interested in safety and health work, we can stimulate habits which in later years, will be conducive to good results. Each one of these lectures can be made the occasion of writing an extended article on the subject which will appear in the local newspapers, where it can be read by the employees in the organization. In other words, by working around a circle, we can keep changing the point of contact of presenting safety material to our employees. In addition to the educational work so far outlined, it is desirable four or five times during the winter, to hire some public hall and give general lectures on safety to the rank and file of the organization. It is not necessary in these lectures, to go to the expense of having individual demonstrations made the same as with the "minute men," but these lectures should be illustrated with moving pictures, or lantern slides, and should include talks by the safety engineers and some of the management, so as to arouse a proper safety spirit among the employees. The

personal touch is a very important matter in successful safety educational work.

Discipline.—Due to the fact that labor in organization is continually changing, it becomes necessary to repeat safety educational work quite frequently. At the present time, one of the most difficult things is to train, in a short interval, a new employee in the same habits of caution that have

Men in testing department practicing the prone pressure method of resuscitation—Pittsfield Works, General Electric Company.

been developed in an older employee through several years of contact. In fact, this constant shifting of labor is the most serious factor with which safety engineers have to contend. It becomes necessary, therefore, at times, with a new employee, to use greater pressure to get him in line with old established practices, such, for instance, as the wearing of goggles. Foremen are the proper centers to work through in administering discipline to employees who

Ellsworth Colliers Company, Lackawanna Steel Company. First aid instruction room, Ellsworth, Pa.

Ellsworth Colliers Company, subsidiary of Lackawanna Steel Company, judging a first aid team's work in competition, Ellsworth, Pa.

will not heed safety suggestions; and while the greatest patience should be exercised to get new employees in line, there are times when all sorts of persuasion fail, where the men are habitually careless, and where rigid discipline is the only remaining hope.

CHAPTER II

Specific Accidents Which May be Reduced by Educational Means

General.—There is no appeal stronger than that of "self-preservation." Following this thought in introducing safety educational work, it is well as a means of arousing great interest, to start with lectures on the direct saving of life, such as the prone pressure method of resuscitation. This may be followed by other lectures covering the use of moulders' shoes in the foundry, the use of goggles, fire hazards, etc. Lectures on safety should be given in such a way as to arouse the interest of foremen or division heads.

Importance of Foremen in Accident Prevention.—There is an increasing tendency in safety work to use the foremen as centers from which to radiate safety ideas. These men should be brought together in groups and given actual instruction in first aid methods and in accident prevention work. When an accident does occur the instructions read that the foreman is to be notified immediately; and he, in turn, sends in the call for medical assistance. The forms for reporting the accident are subsequently filled out by the foreman after an investigation has been made. The foreman is also in a position to make recommendations concerning the safety of his department; he can place orders to have safety devices installed, he deals directly with the emergency hospital, when he desires to have any case investigated, or in case it is necessary to administer help. The foreman, in other words, has every facility and every liberty in instituting accident prevention work and in using discipline if necessary to make working conditions safe. There is every reason, therefore, why foremen should feel the responsibility for such accidents as occur in their departments. They do, as a rule, as is shown by

the pride with which a good departmental record is looked back upon, by the kindly interest in the injured exercised when anything goes wrong, and by the many safety suggestions that originate with the foremen or their assistants. As in safety work, so it is with other things; if we center responsibility in the foreman, placing every facility and suggestion at his disposal, we accomplish the best results.

Prone Pressure Method of Resuscitation.—The "prone pressure method"—sometimes called the "Schaefer method" from Professor E. A. Schaefer, F. R. S., of the university of Edinburgh, who first introduced it—is the method par excellence of giving artificial respiration. All practical arguments are on its side as well as sound anatomical principles. It is easy to learn. It requires no apparatus. There is no delay in waiting until an emergency outfit is found. One person can do it. A mere boy can resuscitate an overweight adult. A greater air exchange—tidal air—can be had than is obtained in normal voluntary breathing. Unlike the Sylvester method, no team work is required; one operator can work for an indefinite time. It meets the complication of the six principal types of suspended animation admirably.

In electric shock, broadly speaking, the blood is altered, veins are dilated and full of blood, arteries are nearly empty, heart is pulsating feebly, nervous system is greatly damaged, there is a tremendous rush of blood to the splanchnic or abdominal vessels, which are found to contain about four times as much blood as normally. The prone pressure method forces this blood back to the anemic brain and to the heart. The regular rhythmic pressure—sixteen times a minute or as we breathe—on the floating ribs, forces the large organs—lower stomach, spleen, kidneys, and large intestines of the abdominal cavity—up against the diaphragm—the musculo-fibrous partition between the abdominal and chest cavities—forcing it up, thus decreasing the size of the pleural cavity, which is an almost perfect vacuum. This forces the air out of the lungs, and effectively massages the heart and tends to help it reëstablish

Showing location of diaphragm.

Pulling down the diaphragm, air rushes in through the glass tube into the windpipe and expands the cat's lungs similar to what takes place in the prone pressure method.

its regular beating. When the hands are removed, the resiliency of the ribs and abdominal organs causes them to spring back. The diaphragm falls, leaving an increased vacuum space in chest, and air naturally rushes in under atmospheric pressure and fills the lungs—the lungs are passive—thus purifying the blood of its excess of carbon dioxide which has been paralyzing the respiratory center.

Other cases that require the prompt administration of artificial respiration are: asphyxiation due to the presence of non-respirable gases; suspension of breathing during the inhalations of ether or chloroform; overdoses of laudanum may produce a condition requiring artificial respiration among other restorative measures; in cases of drowning, the prone pressure method works admirably—the patient lies on his abdomen, head turned to one side, the arms are extended overhead, the tongue falls forward of its own weight, leaving throat free, every time pressure is made upon the floating ribs, water and mucus are expelled from the lungs and air passages, thus increasing the prospects of restoration; in shock caused by a blow in the solar plexus, artificial respiration is required until the disturbed nerve centers recover.

Location of floating ribs.

All cases of suspended animation are alike in that the diaphragm is inhibited. It ceases to rise and fall as it does with every breath of normal respiration, because the brain has ceased to send messages for it to do so. By prone pressure this end is actually accomplished. The patient is

given air to sustain life until brain and respiratory centers recover their functions.

The bell-jar experiment admirably illustrates the action of the diaphragm in normal breathing. The lungs of a cat are carefully removed along with at least two inches of

Backward position—prone pressure method—forward position.

trachea, the trachea is slipped over a piece of glass tubing and tied, tubing is carried up through the rubber stopper of the bell jar. Over the bottom of the jar, a piece of rubber dam is stretched and tied so as to be air-tight. When the rubber is pulled down, the air pressure in the jar is

reduced, the atmospheric air rushes in through the glass tube and trachea, fully distending the lungs. In the pleural cavity the vacuum is more perfect, hence air would flow in more readily.

The main points to be remembered in giving artificial respiration by the prone pressure method are:

1. Quickly to lay the patient on the stomach, turn face to one side, so that mouth and nose do not touch the ground. Extend arms above the head, and quickly remove any foreign body from the mouth.

2. The operator kneels, straddling the patient's hips, or kneels by either side of hips, facing patient's head.

3. The operator places the heels of the hands on the ends of the floating ribs—small of the back—the arms are held straight, and weight is brought from the shoulders by bringing the body and shoulders forward.

The weight is gradually increased until it is felt to be heavy enough to compress the parts—from two to three seconds being required; then the operator suddenly removes pressure by swinging backward, thus allowing ribs and other organs to spring back into place. A complete respiration is accomplished in about five seconds, or the operator can be guided by his own breathing. A folded blanket or coat placed under the abdomen, beneath the floating ribs, facilitates the expiration pressure. The second person should attend to the clearing of the mouth, seeing that the tongue is forward and clothing loosened.

There is no case on record of damage having been done internal organs by the prone pressure method. On the contrary, eminent authorities claim that the movable organs above and below the diaphragm are loosened up, giving freedom of motion to the diaphragm. This means increasing the lung capacity, which in turn gives tone and vigor to the entire system, thus improving the health.

This method is pretty generally used as a means of resuscitation by large factories. It has been made a part of

several gymnastic courses and is used by the United States Army as a part of the "setting up" exercises.[1]

The secret of the method lies in the fact that the operation of breathing is a reverse process to what we ordinarily believe. When we take a long breath, filling our lungs, we *think* we are drawing the air in ourselves, but what we are really doing is to tense the arch-shaped muscle, shown in the figure, known as the diaphragm, under the heart, pressing it down, allowing nature, under an atmospheric pressure of fifteen pounds to the square inch, to fill the lungs with air. In expiration, the diaphragm is relaxed, taking its normal arch-shape position, pushed up by the intestines, liver and stomach, forcing the air out of the lungs, pulling down the ribs and decreasing the air cavity at the same time. If we place, therefore, anyone flat on his stomach and press in on the small of the back on the extreme ends of the floating ribs, over the kidneys, we can easily force up the diaphragm and expel the air from the body, causing artificial expiration. By stretching the arms of the patient over his head, as in the illustration, we increase the cavity of the lungs, enabling the patient to take in more air than normally. Turning the head to one side allows the second individual, who appears on the scene, to draw the tongue forward and remove any material which may be in the mouth, such as chewing gum, tobacco, false teeth, etc., so as to keep the throat from being stopped up. If we relax the pressure on the floating ribs, nature fills the lungs of the patient with air; exerting pressure again, we expel the air. In placing the hands in position, we should press down with the palm of the hand—not the fingers—arms stiff. The hands should not be taken from the surface of the body, but simply resting on the knees, as in the illustration, swing the body forward and backward, exerting pressure with the hands. In the forward position, count three and then swing backward. The motion should be rhythmic, corresponding to the individual breathing, about sixteen times a minute. When the

[1] From article by M. D. Dibble in *Current News*, Pittsfield works.

Patient falls.

Patient turned over.

Arms over head.

Head to one side.

Straddle patient.

Forward position.

Patient resuscitated.

patient starts to revive, he may have a convulsion. If the patient is seen trying to take a breath, relax a second—do not push in the opposite direction—help nature. A folded blanket, slid under the stomach by the second man on the scene, at one of the backward strokes of the operator, helps the method. The principal point to remember is not to lose any time when the accident happens, but begin instantly—save the seconds.

Procedure.—In the case of electrical shock, requiring artificial respiration, catch hold of the person's clothing—*not the hands*—and pull him free. If on a ladder, have some one ready to catch the injured, before opening the switch, so as not to break his neck. Move quickly. Turn the patient over on his face, turn head to one side, stretch arms over head, straddle the patient far enough down so you can sit on his thighs. Place the hands on each side of the small of the back on the ends of the floating ribs; do not press on the hip bones or the center backbone. Be sure your hands are over the tips of the floating ribs, then start swinging your body backward and forward, not too fast, keeping the arms stiff, swinging just as rapidly as you breathe yourself. Our experience shows that it requires about seven minutes to resuscitate the average patient; but the method should be continued for two hours, before giving the patient up as hopeless.

Prone Pressure Method of Resuscitation as Used at Pittsfield Works.—In order to reduce to a minimum cases of electrical shock, a series of meetings are held, during which the prone pressure method of resuscitation, as standardized by the National Electric Light Association, is taught. The nurse in charge of the emergency hospital at Pittsfield illustrates the talk with lantern slides, giving the theory of the prone pressure method. This is followed by a demonstration of the method itself. Every three months, a talk is given to the new college men on test, besides giving them a copy of the rules. In this way, every new college man who enters the test is made thoroughly familiar with this method. The foremen and assistant

foremen throughout the plant are gotten together in groups and are likewise instructed in the prone pressure method. From time to time articles describing the method have been printed in a works' paper.

Five-hundred-and-fifty-volt, two-phase current is used for the operation of all machine tools at Pittsfield. If we compute the voltage across the outside phases and its maximum value, we find this to be equivalent to about 1,093 volts, and in destructive action this is equivalent to about 1,500 volts direct current. By calling this fact to the attention of the crane operators, foremen, mechanics, carpenters, and electricians, this source of danger has been reduced to a minimum. Calling the danger to the attention of employees and showing them how to resuscitate an individual who has been shocked seems to emphasize the presence of the danger, and keeps the men from getting shocked. In other words, the number of cases of electrical shock which have occurred during the past year has been reduced considerably, and during this period there have been five cases where the men, receiving voltages up to 15,000 volts, were unconscious and were resuscitated by the prone pressure method by their fellow-employees. One of the most interesting cases was that of a crane man in the foundry, who was resuscitated by a foundry foreman, who, previous to the shop instructions, had been unfamiliar with the method. At the present time there is hardly a shop or an office in which there are not at least three or four men familiar with this method. It is hoped, in time, to have every man in the organization trained in the prone pressure method of resuscitation, for it must be remembered that this wonderful, simple, and effective method is good not only in cases of electrical shock, but also in cases of gas asphyxiation, drowning, and fainting; in fact, in all cases of unconsciousness. In one case it was used by an employee to resuscitate a man who was unconscious from the effects of a fit.

An important feature of the prone pressure method is that once an individual has seen a demonstration and has

not had occasion to practice it, when the critical situation develops he seems instinctively to know just how to go about doing it. The men are made to feel that the main thing to do with this method is to free the individual, in case of electrical shock, from sources of power and then to begin the method, eliminating as far as possible all lost time. Where the prone pressure demonstration is given to the employees in the foundry, a number of them do not understand the English language. It is necessary, therefore, to demonstrate the method by means of lantern slides and by means of the bell-jar experiment showing the action of a cat's lungs. When the demonstration has been completed, one of the foundry employees, who speaks several languages, addresses the men in their own languages. We find as a result of these meetings that the men are intensely interested. To create additional interest, photographs are taken of the meetings and posted where the men can see them.

The use of resuscitation apparatus has been discouraged, owing to the complications of choice of method, the time necessary to bring the apparatus to the injured person, and the possibility of having the apparatus used by an inexperienced person. The great factor in resuscitation cases is to "save the seconds" and, therefore, if every one can be trained in the same system, such as the prone pressure method, and taught to lose no time in using it, it is believed that the greatest efficiency will be reached. The experience at the Pittsfield works has taught that this is a wise course and by following it, six cases have been saved since its general introduction. A situation may develop in the future where it will be necessary to modify this practice and supplement it by resuscitation apparatus; but until a situation develops the present arrangement will be followed. Should occasion arise where it is necessary to use resuscitation methods on a female, instructions have been given the foremen to slit up the back of the waist, and the corset strings of the injured, and apply the method directly. In addition to this, individual instruction has

been given a number of girls so that they will not lose any time themselves when emergency arises.

NOTE.—*Danger of 550-volt Two-phase Motor Circuits.*—We call a 550-volt railway circuit dangerous. When near a third rail or a fallen trolley wire we exercise, from habit, the greatest care in avoiding contact. Suppose the danger was equivalent to 1,500 volts, would we exercise greater care? It is needless to ask. The purpose of these remarks is to show why a 550-volt two-phase motor circuit should be considered as equivalent in danger to a 1,500-volt direct-current circuit.

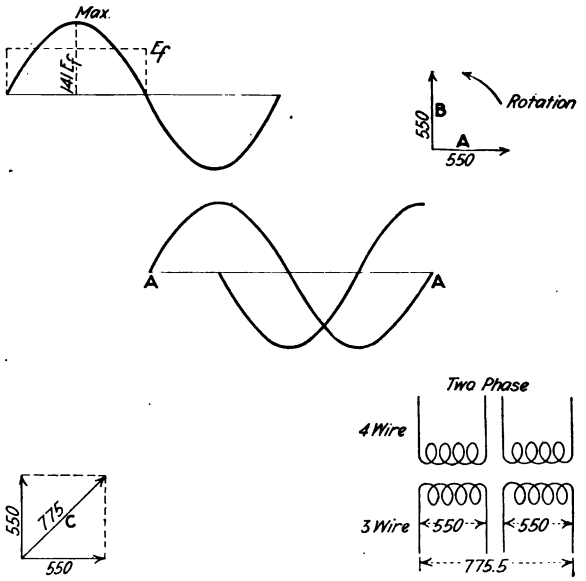
An alternating current is defined as one which has the same *heating* effect as a *direct* current of the same numerical value. Thus 100 amperes alternating current as indicated by an ammeter has the same heating value as 100 amperes of direct current. An alternating current is continually changing in magnitude with each instant of time, flowing through a wire, first in one direction from zero to maximum value to zero again, and then in the opposite direction through the wire from zero to maximum to zero again. The equivalent heating value of this current, or the value we ordinarily specify, is called the effective value to differentiate it from other values. This effective value is smaller than the maximum value of the current by a certain fixed amount for ordinary circuits, the maximum value being the square root of 2 or 1.41 times the effective value. In other words, an alternating current of 100 effective amperes, as recorded on an ammeter, has a maximum value of 141 amperes, the current rising to this value for an instant with each reversal.

This method of reasoning also applies to the voltage of an alternating circuit. A circuit of 550 volts, effective rising in value for an instant to 550×1.41 or 775.5 volts. Leaving aside for the moment the question of increased destructive action due to the pulsating effect, any one coming into contact with one phase of a 550-volt alternating circuit would receive a shock equivalent to the maximum value of 775 volts. But these circuits are not single-phase, they are two-phase, two of the four wires being joined together to form a two-phase three-wire circuit.

What do we mean by a two-phase 550-volt circuit? In this two-phase system we have two distinct circuits to consider, each of 550 volts. We could add these two voltages together and say we had 1,100 volts if we were considering a direct-current circuit; but not so with a two-phase circuit, as these voltages are not the same in magnitude at the same instant of time. When the voltage of one circuit is at its maximum value, the voltage of the other circuit is at its zero value and *vice versa*. A convenient way of representing the relation of these two voltages under discussion is by means of two short arrows of equal length placed like the hands of a clock; only we must consider them as rotating

in a counter-clockwise direction—opposite to that of an ordinary clock.

Thus A and B in the diagram can be considered to represent a two-phase circuit, A and B being two effective voltages equal in magnitude, 550 volts in this case. If these were direct-current voltages, we would draw the hands together, superimposing them, in which position we could add them directly. When they are in the position indicated in the figure, it means that at the instant one is at a maximum the other is zero or 90° out of phase with it—one-fourth of a cycle apart.



Voltage relationships.

This is made clearer perhaps in the third figure, where the instantaneous values of these two voltages are shown; one complete convolution from A to A being equivalent to 360°. If we wish to add the voltages in A and B together as in the second figure, to determine what voltage a man would receive who got across the outside phases of a two-phase, 550-volt circuit, we complete the parallelogram as in the fourth figure, where the length of line C is equivalent to the vector sums of these two voltages. What is the length of this line? Those who have studied geometry will know that if we call A and B each equal to 1 that C will be equal to the square root of 2 or 1.41, the same factor which entered the discussion at the beginning, when we were showing the relation between the effective and maximum values. So the equivalent or vector sum of these two voltages would be 775.5 volts

which would be recorded on a voltmeter if connected across the two outside wires in a two-phase, three-wire, 550-volt circuit, as in the fifth figure.

This value is the effective voltage; and to get the maximum value we must multiply again by 1.41 or 775.5 × 1.41 = 1,093 volts. Anyone, therefore, coming in contact with the two outside phases of such a motor circuit would receive a shock of 1,093 maximum volts. As this pressure is pulsating, striking the individual about 120 times a second, it would be equivalent in destructive action to a constant voltage of about 1,500. This last figure is only approximate, but it is a fair guess and shows why wiremen, plumbers, carpenters, mechanics, etc., working about machines or circuits carrying this voltage should be extremely careful. When the voltage of the wires is not indicated, work should not be commenced until the desired information has been secured from the foreman or from the electrical department. If this practice is followed, it may avoid serious accidents. Wiremen working on circuits of this value should wear rubber gloves, should use tools which are insulated, should handle the circuits only one hand at a time, should be familiar with the prone pressure method of resuscitation, should be familiar with the company's rules regarding the work of this character, and should never work alone.

Resuscitation Recommendations, Technical Paper 77 Bureau of Mines

The recommendations of the committee are summarized as follows:

"In all cases of suspended or inadequate respiration, as in very slow breathing, the method of artificial respiration which can be most quickly applied should be used at once. In most cases, where good air is present, manual methods of artificial respiration are most immediately useful. Of these, the modified prone pressure method, already described, is best. If there is on the victim a local wound that the prone pressure method may seriously increase, the Sylvester method, in which other parts of the body are moved, may be substituted.

"In cases of poisoning, oxygen should be given instead of air. If the victim is breathing at approximately the normal rate, oxygen may be given very simply by fastening to the face of the victim a mask supplied with straps to hold it in place, fitted with an outlet valve opening to the air, and also fitted with a tube having an outlet valve and connected with a breathing bag. Such masks are on the market. The breathing bag is kept provided with oxygen from a cylinder. If the victim is breathing slowly or irregularly, or has ceased breathing, he

should be given the oxygen, in the absence of other means, by a manual method of artificial respiration, preferably the prone pressure method.

"Of mechanical devices for artificial respiration, the committee has examined the pulmotor and the Dr. Brat apparatus and disapproves of them, because repeated suction of air from the lungs, is not physiological, and if continued is likely to result in injury to the lungs and inadequate inflation; and it disapproves of the pulmotor also because the automatic mechanism is so readily disturbed as to be a frail dependence at critical moments."

(Signed) W. B. CANNON,
GEO. W. CRILE,
JOSEPH ERLANGER,
YANDELL HENDERSON,
S. J. MELTZER.

RULES FOR WIREMEN—PITTSFIELD WORKS

1. GENERAL.—Men engaged in the handling of electrical circuits are sometimes exposed to hazardous conditions and it is necessary that they cultivate the habit of being very cautious.

The following rules cover some of the duties and precautions to be observed by wiremen and electricians. If any of the rules are not clear or for any reason it appears necessary to violate any of these rules, consult the Superintendent of the Electrical Department.

2. SUGGESTIONS.—Suggestions, alterations, or additions, which will make these rules more complete and useful are solicited.

3. READ THE RULES.—These rules must be read by men entering upon the electrical work and should be reviewed occasionally by those who are regularly employed in the electrical department. Men must become familiar with the conditions surrounding the work in which they are engaged.

4. RESPONSIBILITY.—No responsibility should be placed on a man until he has confidence and knowledge to do the work.

5. SAFETY DEVICES.—Too much confidence must not be placed in safety devices which are furnished to make the work less hazardous.

Take every precaution to see that the body is well protected before any service is required of a safety device. Remember that it is possible for any safety device to get out of order and become inoperative.

6. RUBBER GLOVES.—Rubber gloves are furnished for the use of those who require them on hazardous jobs. They must not be relied upon to furnish absolute protection. Care should be taken to keep rubber gloves clean and free from grease and other solvents of rubber.

7. TAPPING LIVE CIRCUITS.—No repairs, alterations or examinations requiring handling of live wires should be made except in case of urgent need and then only under the personal supervision of a foreman.

8. GROUNDING.—The frames of all motors, switchboxes, transformers, etc., must be substantially grounded.

9. GROUNDS.—Assume that all circuits are grounded and properly insulate your body against all wires.

10. DANGEROUS VOLTAGE.—All voltages are dangerous for wiremen. If the voltage is not great enough to produce a fatal shock the sign should give its value.

11. DANGER SIGNS.—Danger signs should be placed at all points where one may accidentally come into contact with live wires. Signs should be removed when the danger has passed.

12. TWO MEN.—Whenever it is necessary to make a tap in a live wire or work in the vicinity of live parts, two men must always be employed.

13. TAGGING FEEDER SWITCHES.—When a circuit is opened for the purpose of making changes, the controlling switch should be tagged and blocked, and the tag signed by the man who opened the switch. The switch should be closed only by the man who signed the tag.

If the switch has been ordered open by two men they should both sign the tag and the switch should be closed by the station attendant only when positively notified by the two persons whose names are on the tag. Besides opening the switch, the disconnecting switches or cutouts should be opened as an additional safeguard against having the circuit closed unexpectedly.

14. SHORT-CIRCUITING LINES.—Where the circuit on which work is to be done has been opened, short-circuit the wires before proceeding with the work and keep them short-circuited until the work has been completed. Don't forget to remove the short-circuit when the work has been finished.

15. DEAD CIRCUITS.—Dead circuits should be treated as if they were alive. This develops a cautious nature and may sometimes prevent an accident caused by another person's error.

16. ONE HAND.—As far as possible use only one hand when working about electrical circuits and switches.

17. ROLLING UP SLEEVES.—Do not work on circuits with sleeves rolled up.

18. TOOLS.—Do not use tools or ladders that are imperfect or defective. Report such matters to the foreman.

19. RUBBER MATS.—See that you are properly insulated from ground by a rubber mat, insulated stool, or other insulating material when operating switches, or working on circuits.

20. FUSES AND CUTOUTS.—Pull and place fuses with insulated fuse pullers. Pull the live end of the fuse out first. When placing fuses put live end in last.

Do not leave fuses uncovered. Pull and place fuses very carefully to avoid short-circuits or grounds.

21. Fusing Circuits.—Motors should be fused for not more than three times the motor capacity:

Lighting circuits for not more than twice the capacity of the circuit.

22. Extended Shaft.—If a shaft extends beyond the bearing housing, it should be protected by a proper covering.

23. Rubber Shield.—A shield may be used as a protective device for men working on poles. The shield covers the wires with which the wireman may come into contact while work is being done on a selected wire.

24. Safety Belts.—Safety belts should always be worn by men working on overhead lines.

25. Caution.—DON'T TAKE CHANCES WHEN HANDLING ELECTRICAL CIRCUITS. BE SURE YOU ARE RIGHT BEFORE YOU PROCEED WITH YOUR WORK.

26. Protection For Eyes.—Heavy blue or black glasses should be worn when it is necessary to look at an electric arc.

To prevent dirt entering the eyes when chiseling holes in concrete, stone or brick for the support of wiring devices, protecting glasses should be worn.

27. Damp Places.—To avoid possible shock due to grounding, when work is being done in damp places, extra precautions should be taken to insulate the body.

28. Live Circuits.—Do not work on live circuits until you have received instructions from the superintendent or foreman in charge.

Make the circuits dead whenever possible before work is begun.

29. Lamp Circuits.—When working on lamp circuits be sure that you are well insulated from the ground and the lamp circuit is open.

30. Closing Switches.—Do not close a switch without full knowledge of the circuit. Do not close switch in a hesitating manner, but close it in a positive manner using sufficient force to make full contact of blades.

31. Identify Switches.—As far as possible, all wires, cables and switches should be tagged or lettered so that they may be readily identified.

32. Tampering.—Employees not connected with the electrical department must not tamper with any electrical circuit.

33. Tool Handles.—The handles of tools should be covered with rubber tape to prevent slipping and reduce the opportunity for short circuits across them. Such taping should not be relied upon for safety to workmen.

34. Manholes.—If a cover is removed from a manhole, see that the opening is properly guarded. If the work is being done in a manhole, there should be a man on guard at the top of the manhole.

35. Resuscitation.—Learn the "prone pressure" method for resuscitation from an electrical shock.

36. NEAT WIRING.—All wiring must be done in a neat and workmanlike manner and in accordance with Underwriter's Rules. Wires carelessly installed are dangerous and often are the cause of short-circuits.

37. SWITCHES.—Switches should be left WIDE OPEN when in the open position and FULLY CLOSED when in the closed position.

38. DEFECTIVE APPARATUS.—Report to your foreman all electrical apparatus which is any way defective or inoperative.

39. INSULATION.—Do not trust the insulation on a wire for protection from a shock.

40. DOUBT.—If you are in doubt about the proper performance of any work which you are told to do, say so. *DON'T TAKE A CHANCE.*

41. JOINTS.—Connections between cables must be well made. Wires must be bound and soldered and the joint carefully insulated. When wires are held in contact by means of screws, be sure that the screws are set down *tight.* A slight movement of the wire or cable while setting down a screw will tend to make the joint tight.

42. LOOSE ENDS.—Do not cut the ends of wires and leave them exposed. If the wires cannot be removed, see that the ends are well insulated.

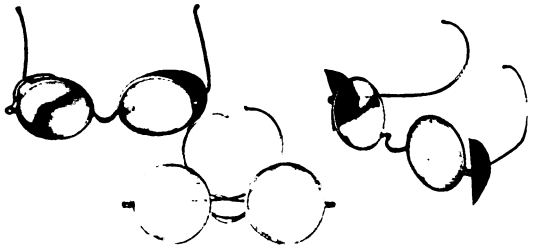
43. TAPPING INSULATED WIRES.—When tapping live insulated wires, remove insulation from only one wire at a time. Do not expose another wire until one tap is made and joint is insulated.

44. A great many employees injured about electrical apparatus are not connected with that work. They are injured through ignorance of the danger or because effective safeguards are not provided. It is, therefore, within the province of the employees of the electrical department to warn all persons, such as plumbers, carpenters, machinists, etc., who are working near the electrical conductors of the danger to which they are exposed.

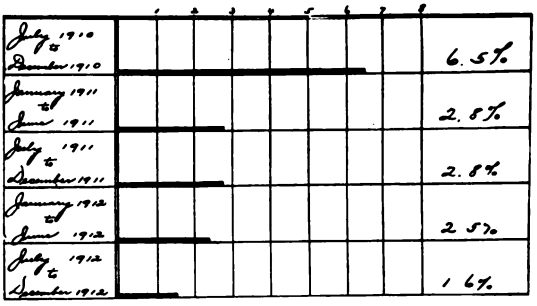
I have read these rules and received a copy of them.

Signed.....

Goggles.—There is probably no safety device that pays for itself with a higher rate of interest than that of the safety goggle. These goggles are purchased by a company and supplied free to any employee who feels that he is in need of them. They are usually used where there is a possibility of flying particles, such as metal chips, molten metal, sawdust, emery, etc., entering a workman's eye. Where possible, the use of these goggles should be compulsory. In the foundry at Pittsfield there was formerly a



These goggles are furnished free by the Company to those requiring them. Before giving out a pair of goggles which has been used before, they will be sterilized at the Emergency Hospital—Pittsfield Works.



Progress in reduction of eye cases by the use of goggles—American Iron and Steel Industry.

Protecting eyes, hair and clothes—Pittsfield Works, General Electric Company.

very large percentage of eye cases, but since the introduction of these goggles, eye accidents have been reduced to a very low point. At the present time, at least one eye a month is saved from serious injury in this foundry by the use of these goggles.

Helmet worn by arc welders to protect the eyes and face from ultra-violet light—Pittsfield Works, General Electric Company.

One of the most interesting cases was that of a foundry employee who refused to wear goggles and was discharged. On coming back later he was reëngaged, conditionally, upon his wearing goggles. In about one week's time he came to his foreman with both glasses completely smashed. Both eyes had been saved. Now he is a most urgent booster

for the use of the safety goggles. Where acetylene torches are used, colored goggles are used by the men so that their eyesight will not be injured by ultra-violet light. In a number of cases employees have taken to wearing goggles on their own initiative after reading published literature in a works' paper, or after hearing some safety talk.

Complete protection.

Burned Feet in the Foundry.—To reduce foot burns in the foundry, the moulder's shoe, which has been so successfully used by many of our American foundries, should be introduced. From the illustration it will be noticed that this shoe is nothing more than the old-fashioned congress shoe. They are arranged so that when metal falls upon the shoe, it will quickly glide off. In case metal should get in the top of the shoe, the shoe can be quickly kicked

off. These shoes have some asbestos in the sole, although their principal advantage consists in the points previously mentioned. They are ordinarily sold of a good quality for $2.00, although the cheaper qualities have been sold for as low as $1.50. These shoes may be distributed through a local shoe dealer rather than by a company, the dealer giving the employees the benefit of his discount,

Poster for eyes.

selling them for a lower price, such as $1.80. Prior to the use of the moulder's shoe at Pittfield, moulders have come into the hospital wearing laced shoes with pieces of metal the size of a dollar burned into their feet, the metal having caught in the laces. Asbestos leggings may also be used in addition to the moulder's shoes to reduce foot burns. A further factor which contributes toward the reduction of

accidents is the use of a small ladle for carrying metal. Where a ninety-pound ladle is used, there is a tendency to spill the metal, which explodes as soon as it strikes the ground. By using a smaller ladle, less metal is spilt.

Last November, one of our deputies, who is a practical foundry man, visited one of the largest foundries in the State. "The general manager asked him if he could assist him in securing 100 moulders. He said, 'I am in great need of moulders. Right now, I have 30 men off with burned feet.' The deputy asked him, 'Why don't you stop the burns?' and then explained to him how a number of large companies had adopted the plan of purchasing moulder's congress shoes and selling them to the men at cost. This plan enables the foremen of the foundry to enforce the rule regarding the wearing of congress shoes. The manager said he would try the plan and ordered a large quantity of shoes.

"The deputy visited the plant a few days ago, and the manager stated that the plan of selling shoes had worked out very successfully. All of the foundry men had purchased shoes, also a large percentage of the other shop men. Since the adoption of the plan the manager stated that the burns in the foundry had been reduced 85 per cent."[1]

Nails.—All safety men look forward to the time when the use of nails in industry will be minimized. Nails, due to their peculiar structure and size, form a very prevalent source of accidents. A few years ago, accidents from nails in the Shipping Department of one of our large factories at Pittsfield, were unusually numerous; but, due to the excellent coöperation given by the various members of the Production Department and the Shipping Department, accidents from this cause in these particular departments have been greatly reduced. In 1914, accidents from nails, in the Shipping Department, were reduced 50 per cent. over the previous year; and in 1915 a further reduction of 50 per cent. has occurred. In 1914 there were twenty-three accidents from nail punctures for the entire plant, involving loss of time of approximately five hours. In 1915, nine similar accidents occurred. This shows the relative progress made.

Up-turned Nails.—If everyone who passes a piece of loose board containing up-turned nails, as shown in the

[1] National Safety Council.

Defective Shoes

"Accidents Don't Just Happen, Each One Has Its Cause"

"Eternal Vigilance Is the Price of Safety"

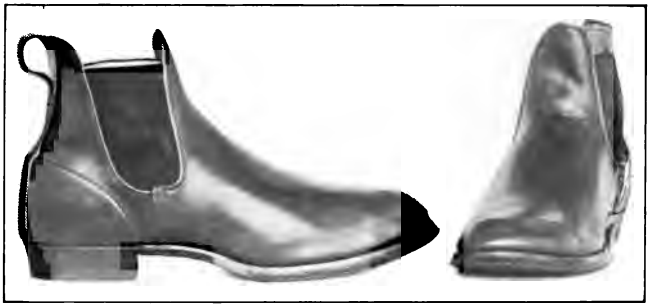
This picture illustrates a very serious burn of the toes of the left foot (loss of time 60 days). You will note that the only place where the shoe is burned is at the little toe. Had this been a good, strong shoe this injury would have been slight, but owing to its broken condition the iron poured through the break all across the top of the foot, seriously burning all the toes. Being a button shoe the employe could not remove it as quickly as he could have done had he worn CONGRESS SHOES

(Courtesy International Harvester Co.)

Poster for shoes.

figure will simply use his heel to press down the nails, it will remove this source of danger from later passers-by.

Band Iron Corners.—One of the ways in which progress in reduction of nail accidents in the Pittsfield Shipping Department has been made, is due to the development of

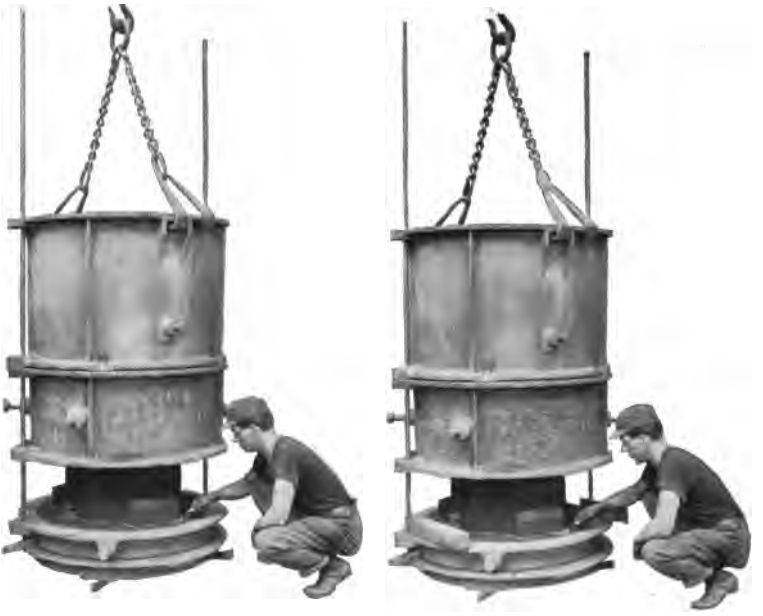


Moulder's shoes.

Using a skimmer to protect hands when pouring metal.

the "band iron corners," shown on page 54. Formerly, strip metal was used to wrap about the edges of transformer boxes to hold the corners together. Through the initiative of Mr. G. T. O'Brien, a special band iron corner for boxes was developed. This corner brace is simply constructed, as shown in the illustration; it consists of two short strips with

holes punched at the proper places for nails. In fastening this corner to the box, they have eliminated the tendency of nails to fly as they formerly did when struck by the hammer, the nail point sliding on the smooth surface of the band iron. One serious accident occurred in the past in which a nail shot off in this manner and pierced the



Incorrect and correct way of using flask. Notice block in right illustration.

eyeball of an employee. Fortunately, the case was promptly sent to the Emergency Hospital and taken care of, so that the sight of the eye was not lost. Since the use of band iron corners has been introduced, cuts from upturned loose ends of the strip metal formerly used have been materially reduced in this particular place.

Hammers.—Another source of danger from flying nails is due to the smooth face of the ordinary hammer. To minimize this source of danger, hammers with serrated heads may be used. These are not entirely satisfactory, as the heads of such hammers are too highly tempered. Small steel chips tend to fly. Regular hammers may be

cut on a milling machine as shown in the illustration. With the crisscross surface, the hammer gets a better purchase on the nails and keeps them from flying, besides which the lower tempering keeps parts of the hammer from flying.

Keep Floors Clear of Nails.—An important feature in the reduction of nail accidents is to keep the floors free from loose nails. Floors should be swept up frequently, to keep the floors absolutely free from nails. Otherwise nails will be run over by trucks handling freight, and will be shot out from under the wheels.

Treatment of Nail Punctures.—A wound from nail puncture is usually deep, and when the wound occurs some of the surface infection of the skin, which is always present, is carried into the wound. It is not so much what is on the nail at the time as what is on the surface of the skin. Such a wound should have a little tincture of iodine painted on its surface. It should then have a boracic acid compress (a small pad of gauze moistened with boracic acid) placed over the wound; it should then be bandaged. Every two hours moisten the compress. Inside of a couple of days the wound will be completely healed from the bottom out and danger from blood poisoning will be eliminated.

Don't Neglect Nail Punctures.—Some people feel that their blood is in such good condition that nature will look after them and that they, therefore, can neglect nail wounds. Nature sometimes gets tired looking after people, especially when the person is tired himself and his vitality is low, with the result that serious trouble from blood poisoning follows from neglected nail wounds.

Ruptures.—This matter is discussed under "Medical Inspection of Employees," where is given the educational literature which may be used to show men how to lift, and to instruct employees in the nature of ruptures. These data may be used in lectures as well as in works' papers.

Punch Press Accidents.—Accidents from punch presses are usually serious, the employee's hand or fingers being usually completely crushed due to the power behind the press. Employees placing material between the jaws of a

press may do so thousands of times without being caught and then some day the foot may slip and trip the press, the clutch may fail to catch or the press may repeat, resulting in the loss of part of a hand before he is conscious of what has occurred. Many guards have been developed to elimi-

Stepping on nail.

Removing danger with heel.

nate punch press accidents, and many other devices to keep employees from placing their fingers under the presses. The difficulty with all of these devices comes from their interfering slightly with production, the employee taking a chance, when his foreman is not near, to discard the device. The most successful way in the writer's knowledge

of meeting this condition is first to equip all presses with non-repeat attachments, for many of the most serious punch press accidents encountered by the writer have come

Special hammers and corner braces.

Treatment of nail punctures.

Neatly arranged stock—Shipping Department, Pittsfield Works.

from the presses repeating. In addition to the non-repeat attachments, if employees are supplied with duck-bill pliers to place the material between the jaws of the press,

The incorrect way of feeding a punch press using the hands.

The correct way of feeding a punch press using the pliers.

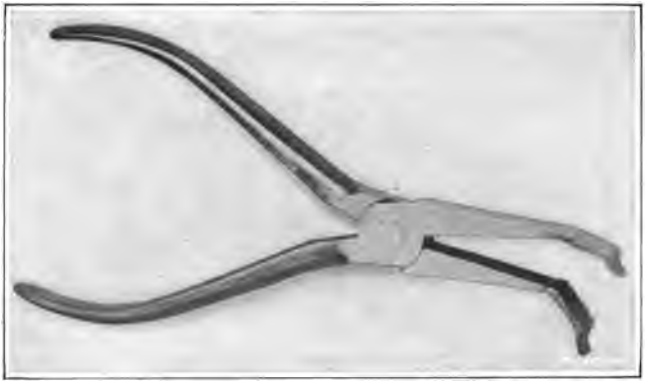
and the use of these pliers as insisted upon, it will be found that accidents from this source will be reduced extensively. A recent suggestion has come to the writer of having a small spring placed between the handles of the pliers to open them automatically. The illustration shown in the figure of a pair of pliers is of interest. This pair of pliers was used by a man who was forced to use them; the press repeated, bending the ends of the pliers as indicated. The man's fingers were saved against his own will.

Flying Objects; Mushroom Heads on Tools, Falls from Ladders and Scaffolding.—It is important that all tools used by employees, such as cold chisels, should occasionally have their heads ground. If this is not done small chips from the ends of the tools will fly off, which may pierce a workman's eye. This has happened many times. Some companies overcome this danger by having periodic inspection of tools, all tools with mushroom heads being ground before being redistributed to the tool rooms for further distribution to employees.

It will be noted from the compilation shown in the illustration, prepared by the Industrial Commission of Wisconsin, that injuries from falling objects, flying parts of tools, chips, and nails, are prevalent, and the only manner in which accidents may be avoided is through constant inspection and education.

Crane Accidents.—Training crane operators to avoid accidents is an important part of safety supervision. When we consider in a large manufacturing plant the enormous amount of material which must necessarily be handled by cranes, the many lifts required, the reliance that must be placed upon proper hitching of cables, upon the brakes, upon the tensile strength of cables, upon safety limit switches, upon the use of proper signals, etc., we see how very important it is to have a well-organized system of supervision of crane safety. Regarding crane signals, the operator in the cage of the crane should be primarily responsible for crane safety. He should inspect the operating mechanism of the crane as soon as he enters the carriage

for duty. He should see that all switches, brakes, etc., operate properly. He should see that no loose tools or other loose material are on the running boards of the crane, and he should have a definite understanding with the crane hitchers regarding the giving of signals. If any repairs are being made in which repair men are in danger of accident from a crane, a rope should be stretched across the two tracks and a danger sign suspended at its middle point, so that the operator, who naturally looks down from his cage, will see the sign as he approaches the danger point. Should the crane wheels strike the rope it will cut the rope



Pliers caught in punch press. The use of these saves many fingers.

allowing it to fall. Some companies use crane stops on the tracks. These are dangerous as they are likely to throw the crane wheels from the tracks. Torpedoes have been placed on the tracks and used with success in some places. Where repairs are being made on the crane itself, a sign "man above" is usually placed on the floor below the crane, so that if tools fall, they will not endanger workmen below. Every crane should be provided with a limit switch to prevent the block from being run into the drum. Many forms of limit switch have been developed in the past and have failed in operation. Some of the failures were due to devices not being properly constructed mechanically; other failures, and, in fact, the more serious ones, have been due

Dangerous Tools

The "burrs" on the heads of these sledges are very dangerous. They are apt to "fly-off" and cut open an eye.

Tools should be regularly inspected and repaired. This means "Safety First".

(National Safety Council)

Poster for burred tools.

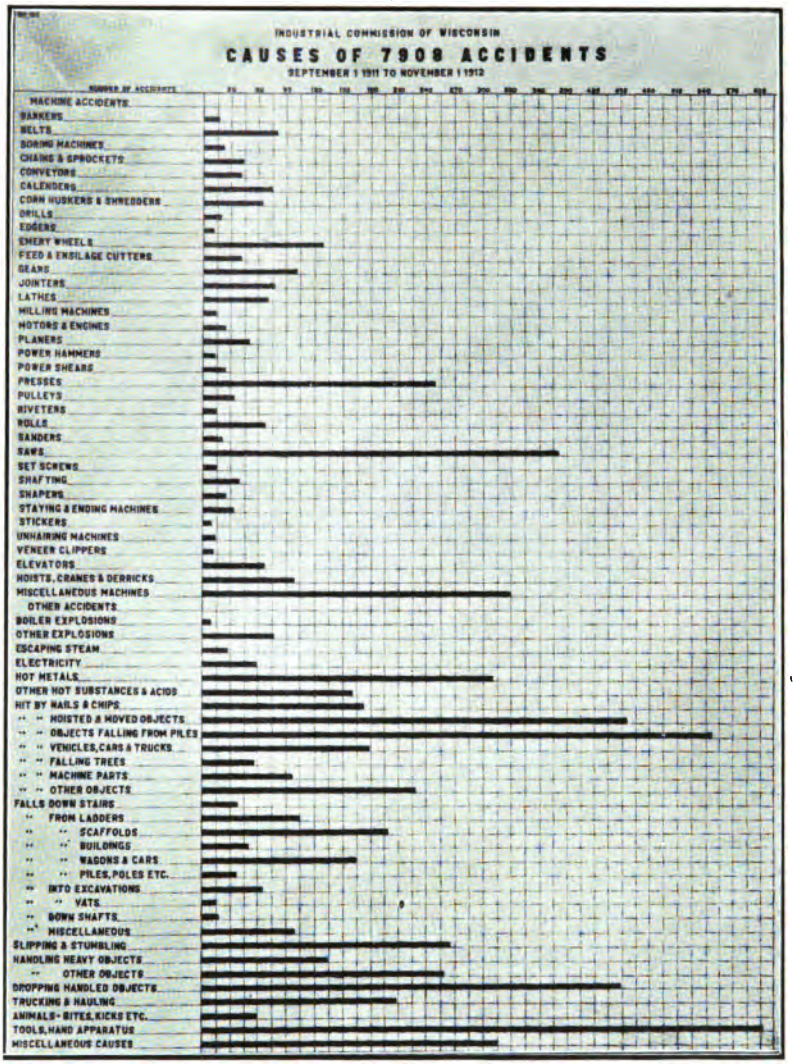
to the carelessness of operators in moving their blocks beyond the danger zone. As an illustration of fatal carelessness, an operator, having to lift material over a particularly high obstruction, sometimes raises the load until the block strikes the safety stop, and opens the switch on the top of the crane. He then goes on top of the crane, closes the switch, raises his load still higher until it clears the obstruction, moves his load to its destination and lowers it to the floor. The writer knows of several serious accidents, some fatal, which have resulted from this practice. The operator would forget that he was operating in the danger zone, run the hook into the safety stop and drum, break the cables and drop the load. To eliminate this danger, two forms of limit switch were developed at the Pittsfield works. The figure shown in the illustration, employing a cable with a magnetic blowout switch, is the latest development, and is now being manufactured by the General Electric Company. Both of the latest Pittsfield safety stops are foolproof, as they employ a rigid rod between the safety stop and the switch, making it impossible for an operator to go beyond the danger zone. The form employing the cable is preferable to the rigid foot as it takes care of a swinging load. Since these particular forms of limit switch have been used, we have not had an accident from this cause. The matter of making crane hitches is also important and worthy of careful study to see that strains are properly distributed. An excellent article by Mr. J. Riddell of the Schenectady works of the General Electric Company appeared in the *General Electric Review*, March issue, 1913. The reader is referred to this article where many of the important forms of hitches and knots are most beautifully illustrated and described. One point in passing—care should be taken when handling tall slender objects, to learn how to make short hitches which will not necessitate operating the block too near the limit switch. The following brief concise crane rules should be printed on a card and hung in the cage of the crane. Crane operators should learn the rules and if the rules are not followed, operators

Rope slings like these should never be used, says J. P. Eaton, Chairman Safety Committee, Schenectady Works. Think of the safety of those who work under the traveling cranes, and use nothing but sound new rope. Refer to safe loads for manila rope for diameters given in the following table:

In.	Lb.	In.	Lb.	In.	Lb.	In.	Lb.	In.	Lb.
1/4	55	5/8	400	1 1/8	1100	1 5/8	2200	2 3/8	5000
5/16	100	3/4	500	1 3/16	1200	1 3/4	2700	2 1/2	5550
3/8	125	7/8	600	1 1/4	1380	1 7/8	3000	2 5/8	6200
7/16	160	15/16	740	1 5/16	1570	2	3500	2 3/4	6870
1/2	220	1	880	1 3/8	1770	2 1/8	4000	2 7/8	7500
9/16	300	1 1/16	1030	1 1/2	2000	2 1/4	4500	3	8000

Table by Swift & Co.

Defective ropes.



Report of Industrial Commission of Wisconsin.

OPERATION AND CARE OF CRANES

(1) It shall be the duty of the crane operator to keep his crane clean, oiled, and in proper operating condition and have grease cups turned down or refilled once each day.

(2) He shall examine his crane every morning to ascertain if all gears, brake wheels and keys are in their proper places.

(3) Cranes are to be cleaned once each week and the foreman in charge shall allow the operator a reasonable length of time to do this work.

(4) The operator shall keep solenoid brakes, fingers and segments in controllers properly adjusted.

(5) The operator shall be responsible for the load from the time it has been raised to carrying position until he receives signal from the hitcher to lower.

(6) The operator shall carefully watch the position of the hoisting hook and exercise extreme care when it is near the limit switch rod to avoid running the hook on the drum.

(7) The limit switch is a safety device installed to operate under emergency conditions only and does not relieve the operator from the responsibility of accidents resulting from carrying the hoisting hook too high.

(8) The limit switch shall not be made inoperative to attain a greater lifting height.

(9) Do not move load without signal from proper man. Be sure to recognise signal from one man only.

(10) The operator shall see that the load is kept behind the hitcher and high enough to clear anything on the floor, but not unnecessarily high.

(11) The operator shall, as far as possible, avoid carrying the load over the heads of persons on the floor.

(12) Do not permit your crane to bump into another crane until you are positive that no one on the other crane is in a position to be injured.

(13) When handling heavy loads, particularly hot metal, test hoist brake by throwing controller to "Off" position after load has been lifted a few inches; if brake does not hold, do not move crane until it has been repaired or adjusted.

(14) The operator shall never reverse any of the motors before coming to a full stop except to avoid accident or injury to a person or property.

(15) Do not open the main switch until all controllers are in the off position.

(16) Never leave the crane cage without opening the main switch.

(17) Never go nor allow anyone else to go on top of crane without opening the main switch and placing a warning sign on the switch bearing your name.

(18) When main switch is found open, do not close it until you are absolutely sure that no one is on the crane or the crane runway. Examine both carefully.

(19) When crane is down for repairs, assist repair man. After completion of repairs, make sure that bolts, tools, etc., have been removed so that no damage to machinery will result when crane is started and so that nothing will fall from the crane.

(20) When men are making repairs on cranes, be sure that a danger sign "Workmen Above" is placed under the crane on the floor.

(21) When repairs are being made on the crane runways or where there is a possibility of striking an individual, see that a danger sign is placed within breaking distance of individual, also have a man ride on end of crane with you.

(22) Crane should always be left at the ladder when operator is through his shift.

(23) Crane operators should not run down ladders quickly

(24) If any of these rules are not perfectly clear, and if any trouble occurs in the crane which you are unable to remedy, confer promptly with the crane inspection department.

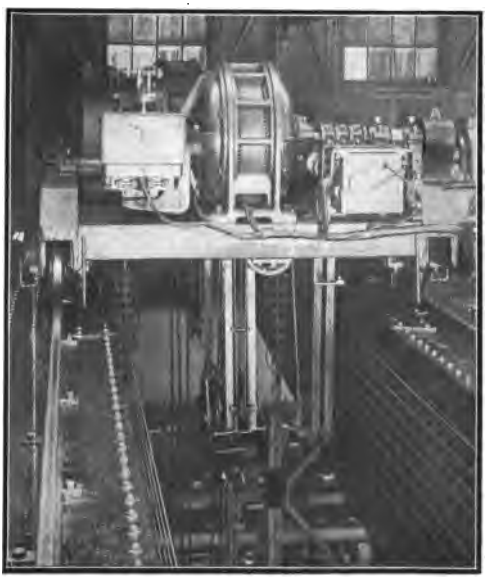
(25) Two copies of these rules are to be signed by the craneman, one for file in the Superintendent's office, the other to be kept by the craneman.

(26) I have read these rules and received a copy of them and agree to follow them.

(Signed).....

should be transferred to other positions, as crane operators must rank 100 per cent. in safety work.

Many companies are giving up the use of chains in hitching because of the difficulty of properly inspecting the links of the chain. Where cold-rolled links are used, the links are weak where the bend occurs. Cables are, therefore, preferable as they are more uniform, indicate weaknesses more quickly, and may readily be tested. Regarding the use of audible signals, we have found the use of whistles.



Foolproof safety stop for cranes in use—Pittsfield Works, General Electric Company.

gongs, etc., are not reliable, as men get accustomed to hearing them. In some places large rotary gongs have been used successfully. We make the hitcher, where possible, always precede his load and give the signals. He can warn people to keep from under the moving load. Where possible cranes using magnets for lifting purposes, should be avoided for interior work, as an insulating film is liable to form on part of the surface of the magnet; and material sliding over the surface of the magnet, due to gravity, meets the insulating film and the material falls. Remember,

that a very small air gap introduced between the magnet and load in this manner will weaken the magnetic strength to such a point that it cannot hold the load. Cranes should also not be used to drag loads. In some foundries objects are drawn over the sand floors in order to smooth up the floor. This is not advisable, as it gives a side strain on the crane which it is not designed to resist.

Dangers in Use of Wood Alcohol.—In the pattern shops of some companies the practice has become common of using wood alcohol to mix shellac, the impression existing that the shellac so dissolved dries more quickly. Wood alcohol is particularly dangerous to handle. When it enters cuts or cracks in the hands, poisoning results. When taken internally, and some men will drink anything with an alcohol label on it, it causes permanent blindness. Many cases are on record of blindness resulting from drinking wood alcohol. In the brewing industry particularly, men have to enter the interior of hogsheads and paint them with shellac; and many instances can be mentioned where blindness has resulted from the fumes given off by the shellac made with wood alcohol. The writer was particularly interested in a large industry where wood alcohol was used. Without saying anything to the employees, denatured alcohol was substituted gradually for the wood alcohol. There was not one operation in which the men could detect the change. As a result of investigations, wood alcohol was completely eliminated from the works, denatured alcohol introduced, a serious source of danger avoided, and incidentally, a saving of $2,500 a year was effected by the change.

Infection from Use of Gasoline.—There are many manufacturing industries where varnishes and enamels of various kinds are used for dipping finished materials. In some cases the varnishes are used for insulation purposes, as in electrical apparatus; in other places it is used for giving an artistic finish. Employees have acquired the habit of using gasoline to wash the varnish from their hands. The hands have become poisoned from the use of the varnish and it

has been difficult to locate the cause, for, on analysis, the varnish contained no ingredients which appeared to be poisonous. An investigation of this matter by the writer showed that what actually happened was, that the frequent use of gasoline cracked the surface of the employees' hands, infection of various kinds entered the cuts and inflammation resulted. By placing a tub of soapy water so employees could rinse the gasoline from their hands after washing the varnish therefrom, this source of infection has been completely eliminated. Teach the employees to use soap and water habitually after removing the varnish with gasoline, and no infection will result. Where gasoline is used, its dangerous characteristics should be fully understood and all manner of sparks from matches, paper, or static discharge should be carefully avoided. When pouring gasoline, see that metal parts of container and receiving objects are in contact. As high as 500 volts—static—may be developed by the running gasoline, if the objects are not in contact. Many garage fires have been started in this manner.

Fire Prevention.—There is probably no form of accident prevention which has been developed to a greater extent or over a longer period in this country than the prevention of accidents due to fires. In fact, the matter has been gone into so thoroughly that the record for freedom from loss of life is almost 100 per cent. The larger operating companies usually start by building fireproof structures of concrete, brick and steel with metal partitions, wide halls, large window space, and ample exits. These buildings are then equipped with automatic sprinkler systems, care being taken to see that frequent inspections are made by a regularly organized fire department to see that pressure is always maintained. At a recent interview which the writer had with an expert on fire prevention, the statement was made that there was no fatality on record in fires occurring in buildings equipped with automatic sprinklers in which pressure was maintained. One case was mentioned in which life was lost but in this case the pressure was not

Fire drill. Six streams of water over Pittsfield Works' Foundry.

on the sprinklers. This point is mentioned to show that where a sprinkler system is installed and properly maintained, the danger from fire is really very small. Where, however, the buildings are of fireproof construction,where fire drills are systematically carried on, especially where female help is employed, and a regularly organized fire department is maintained, the danger is very small. In manufacturing industries where large amounts of japan, benzine, oil, and other inflammable materials are used, too much attention cannot be devoted to inspection and to obtaining detail coöperation as pointed out in the attached comments by Mr. P. W. Power,[1] Mechanical Engineer, Pittsfield works.

1. THE MAIN THING ABOUT FIRES IS TO PREVENT THEM.

2. In manufacturing electrical apparatus there is more opportunity for fires than in some other lines of work. Certain departments requiré special care on the part of employees. Such departments are: painting and japanning where benzine or other solvents are used which are very inflammable and, under certain conditions, also explosive; insulating departments where linseed oil, varnish, benzine, alcohol and other highly inflammable materials are used; also departments in which cotton, numerous soldering irons, lead melting pots, etc., are required; and testing departments and all other places where electric wiring, much of it carrying current at high voltage, is to be found. Also in this business a great quantity of transil oil is used in the insulation of transformers, regulators, switches and other apparatus and in treating wood, and, while this oil is not especially liable to become ignited, when once burning it makes a bad fire and one that is hard to put out.

3. In departments that use japan, varnish and oil tanks, and in baking ovens where special risk is involved, special equipment for putting out fires has been provided. Some of the ovens are connected with steam pipes to smother fires. Some of the testing departments have a supply of carbonic acid gas for putting out oil fires in closed tanks. In some places sawdust boxes for smothering japan, varnish, or benzine fires have been installed.

4. The employees in departments where these special conditions exist should know the purpose of the appliances and know how to use them, and it is important for each to do his part in seeing that such appliances are not tampered with, nor their value impaired in any way through the carelessness or stupidity of some fellow-employee. For instance,

[1] "Fire Prevention."

what good is a fire pail, that is supposed to contain water, if the pail has been emptied through the carelessness of someone and hung back empty on its hook? Or what good is a sand box, if someone needing a shovel for some purpose has taken the shovel that belongs to the sand box and failed to return it? No fire equipment should be meddled with or used for any other purpose than for what it is intended. It is obviously to the advantage of all to further the prevention of fires in the first place and to keep cool and act quickly if a fire gets started.

5. The main thing about fires is to prevent them. Fires are of two kinds: those that could not have been foreseen and those that could have been prevented. Nearly every large fire starts as a small one. Keeping these two things in mind (first, that most fires can be prevented; and second, that most all fires have a very small beginning), it at once calls attention to the importance of prevention before the fire and of quick action while the fires that do start are yet small. The work of putting out small fires is usually done quickly by the person nearest at hand, but occasionally some small fire starts when no one is near, or it so quickly becomes a large fire that the fire department is called and they proceed in the regular way and by use of the regular fire equipment to put out the fire; but the important work of fire prevention is constantly under way and can and should be shared in by all employees.

6. The policy of the company is to provide substantial buildings of fireproof or of very slow-burning construction and to equip the buildings with sprinklers, interior hose lines, fire pails for sand and water, outside hydrant connections and a fire alarm system; but all of these things, excepting only the original construction of the buildings, are for use after the fire is once started, while the great work of prevention is a constant need that requires the interest and help of all.

7. As fires usually start in a small way, it is the little things that each individual can take a part in that help to prevent fires, such as keeping lockers and bench drawers in good order and free from oily waste or oily overalls; making use of metal receptacles for oily waste and other material that burn readily or that may start a fire spontaneously; keeping wood, shavings, cloth, etc., from steam pipes; reporting gas and oil leaks; seeing that flexible hose connections to gas pipes are in good order; using gasoline with great care and only in closed cans, keeping passageways to fire pails and inside hose lines open and free from obstructions, etc.

8. It is of particular importance to have every individual know the location of the sand or water pail nearest to his work, the nearest inside mill hose line and the nearest fire alarm box. Every employee should also know two ways to get out of the building and those that know these things can benefit themselves, as well as their companions, by telling those that do not know and, especially, showing the importance of these

things to new employees and thus preventing panic and confusion should a fire occur.

9. During the past year the fire alarm has been rung in twice when there was no fire, because of the presence of smoke from a tar kettle or locomotive standing outside of the building. Probably prompt action when a fire is once discovered is more commendable than most anything else, but when such action is coupled with coolness and certainty it is all the more commendable. While employees should be quick to ring in an alarm in case of fire, it is also desirable that they be

In case of fire, fuse melts, releases lids which close and smother fire.

quicker still to make sure that there is a fire, if possible, before ringing in an alarm.

10. In the first part of these notes no mention was made of our fire department, among the list of protective equipment. A fire department comprising a chief, assistant chief and from 35 to 40 men, responds whenever the fire alarm calls them. The members of the fire department are selected from different departments, so that they will be generally distributed throughout the works, and members are appointed only on recommendation of the foreman of the department in which they work. The company values and highly appreciates the services that these men give, and, as a slight token of this apprecia-

tion, have recently inaugurated a plan of giving to each man who has been a member of the hose company for ten years a gold pin as a memento.

11. Besides the fire department there are regular patrolmen who inspect the buildings and yards day and night. While it is the business of these men to see things and report them or have them attended to, they cannot see everything.

12. All employees should make it a point to know who the fire department members are in their particular division or building, so that they can call the attention of these members of the department from time to time to whatever they see that looks to them like a fire risk. The members of our fire department will be glad to talk with any employee about any fire risk or about how to act in case of fire, and they will, in turn, present any information that they collect in this way to the fire chief for further action when warranted.

The Main Thing About Fires Is To Prevent Them

The idea of the fusible plug used in sprinkler systems can be carried still further and used to advantage in automatically smothering fires that start in dipping tanks. Iron doors, hinged and swung beyond the center of gravity, are held in place by fusible links which melt in case of fire, and close the lids as shown in the illustration. This same idea has many other applications.

Fire Drill Suggestions

Don't get excited.
Don't crowd.
Don't stop for personal effects.
Don't talk while marching.
Don't lock arms while marching.
Don't forget the drill signals.
Don't delay in dressing rooms.
Don't throw these directions away.
Don't fail to follow your leaders.

CHAPTER III

Medical and Physical Examination of Employees with Special Reference to Tuberculosis and Hernia

Workmen's compensation laws, created for the purpose of reducing accidents in industry, form part of the code of many States. As health plays an important part in accident prevention work, employers are taking greater pains to inquire into the physical fitness of present employees as well as of new employees. This is not being done with any idea of shirking the responsibility of the welfare of employees, as many companies have elaborate schemes of vacations, rest rooms for girls, visiting nurses, social activities for employees, plans of caring for tuberculous employees, old-age pensions and profit-sharing schemes. Where such responsibilities are assumed for those forming part of organizations, and where large sums are being spent to increase the efficiency, health, comfort and safety of these employees, it is natural that employers should be extremely cautious of the physical condition of those about to enter their organization.

The introduction of medical and physical examination of new employees is one of the greatest steps taken in recent years, toward placing a premium on health. Take, for instance, a college boy preparing for engineering work and let him know that his whole future career depends upon his leading a clean life, and it will do more toward raising the standard of college morality than many reforms which could otherwise be instituted.

Admission to the Army and Navy, admission to fire departments, police departments, life insurance tests, require a high degree of physical fitness. Why, therefore, should employers not follow these well-established pre-

MEDICAL EXAMINATION

Name.....Age.....Wt.....Ht.....Serial No.

HEAD AND NECK: Evidence of previous injuries?.....

EYES: Vision (Snellens) R.....L.....Wears glasses?.....EARS: Hearing (Ingersoll) R.....L.....

MOUTH: Tongue.....Throat.....Teeth collectively, Good—Bad.....

LUNGS:.....

HEART:.....*Pulse.....*Temperature.....*Blood pressure.....

ABDOMEN:.....

Canals: Inguinal.....Size of external ring: R.....Fingers, L.....Fingers.....Femoral.....

Umbilical ring.....Genito-urinary organs.....

Skin disease, Yes—No.....Scars from operation or disease.....

EXTREMITIES: Hands and arms.....Joints.....

Feet and legs.....Varicose veins.....Ulcers.....

*Reflexes.....

SPINE:.....

GLANDULAR SYSTEM:.....

Hemorrhoids, Yes—No.....Fistula, Yes—No.....

APPEARANCE, That of temperate person? Yes—No....Scars or evidence of syphilis? Yes—No...Vaccination scar? Yes—No.....

Nervous temperament? Yes—No.....

GENERAL CONDITION OF BODY: Good—Fair—Bad.....

DISQUALIFYING DEFECTS:.....

.....

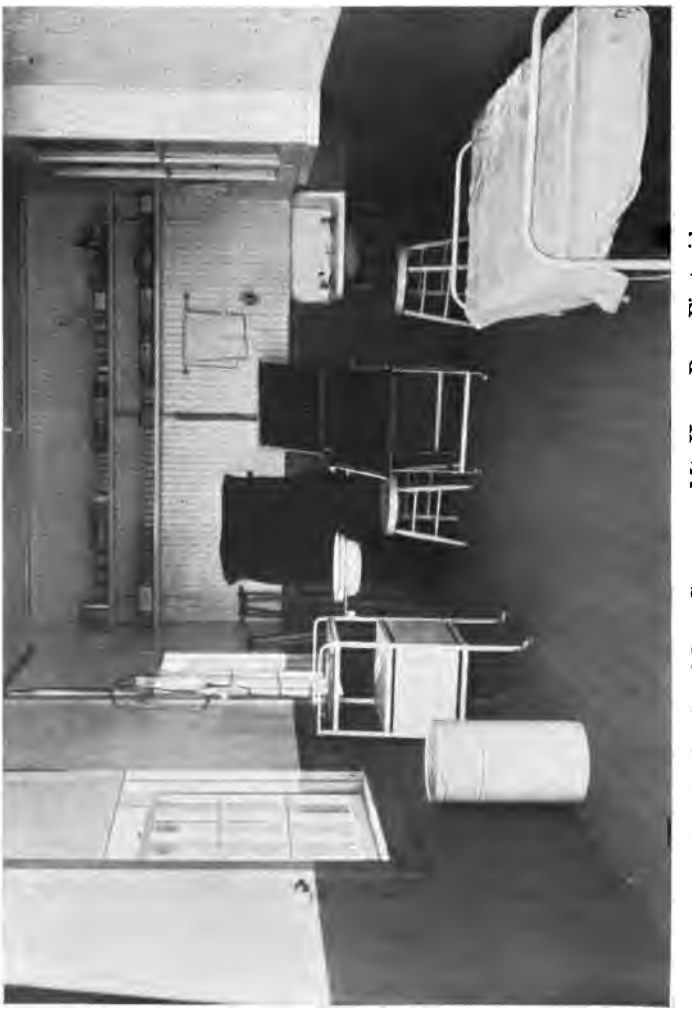
.....

.....

.....

Accepted, Yes———No.....(Signed).....

*Record to be made at option of examining surgeon. Date.....Examining Surgeon



Empire Steel and Iron Company, Mt. Hope, Pa. First aid room.

The Kingston Coal Company, Wilkes-Barre, Pa. First aid room at mines.

cedents, especially when a large share of the burden of liability for accidents occurring as a result of personal weakness rests at the present time upon the employer?

Where a company supplements medical inspection of new employees with that of periodical inspection of old employees, it is done for the purpose of locating tuberculosis; venereal diseases, which may be transmitted to other employees; cases of hernia, or weaknesses liable to develop into bad cases of rupture under continued strain. When companies do not follow a system of medical and physical inspection, there is a tendency to get the defectives from other companies. The following statement of Mr. Morey of the Commonwealth Steel Company, made in 1914, bears this out:

"We have not started our physical examinations yet, but we expect to next month. We have been preparing to do it. We were compelled to do it through having a number of hernia cases where there is a lot of heavy lifting. I believe the Ohio Industrial Board has ruled that hernia is not an 'accident.' A susceptibility to hernia is discernible and we thought in self-protection we should know that. And the same with traveling crane men; we thought we should know something about their physical condition. We had a man who had a fit, and he fell into a 'heat.' Then too, we have had situations arise where falls could have been claimed to have been caused by accidents when they were not. The thought also has been brought out, how other companies having examination of employees, forced us to do it. That gave us the offscouring from the other companies. We had information that some men who had been rejected at other plants came to our plant and secured employment, which is, of course, very undesirable."

The medical examination required by the United States Army requires a high physical standard to pass. The system followed is to require a preliminary examination followed by a complete examination. Out of 30,000 recruits, five times as many were rejected after making the first examination. Out of 1,000 accepted recruits, 124 were rejected on the second medical examination.

At a conference on "Medical Examination of Employees" held in Washington, Dr. Harry E. Mock of Sears, Roebuck Company, Chicago, presented the following data showing

their method of handling this work as well as the result of several years' experience:

"Every employee, male and female, from the head of the concern down, should be examined. Naturally, the greatest interest should center on the present working force and here the physical examination of employees should begin—there should be a general house-cleaning. This, of course, will take a great deal of time, depending on the size of the working force and number of doctors employed. The best method is the systematic examination of employees in department after department until all have been examined. But the examination and reëxamination of the old working force is inadequate unless the portals of the industry are guarded. Therefore, an examination of all new employees is the second essential in raising the health standards; likewise, it is the first essential in protecting the concern from workers who are below par.

"*When* to examine these new employees must be determined by each industry. The ideal time is before beginning work. From a practical basis, however, this is frequently impossible; for instance, when a large number of people are employed, often temporarily and upon very short notice. Therefore, a flexible rule must be adopted so that, where possible, every applicant for work shall be examined before employment. Otherwise, they shall be examined the first week or month of their service.

"Another ideal arrangement in this scheme of medical supervision would be the repetition of these general examinations at stated intervals —say, every six months. Again, this is not practical, especially in our larger industries, owing to the number of doctors necessary at all times to accomplish this. A comprehensive, yet workable system, which the writer has gradually evolved during the last five years for the examination and reëxamination of employees in a large industry of Chicago having over 10,000 men and women, is adaptable to any concern.

"Any employee who at the first examination is found to have the least suspicious findings of any disease is filed under the heading of 'Reëxamination.' In the course of a week, month, or three months, according to the doctor's decision, he is recalled and again examined. This is repeated as often as his condition warrants.

"Other types of suspicious cases are assigned to a nurse to have their temperature and pulse watched morning and evening for one or two weeks. If any abnormal condition is found in the temperature chart of such an employee, he is relieved from work until a final diagnosis is made and his future care outlined. Likewise, when an employee returns to work after some chronic disease has been cured or arrested, he is frequently examined to guard against a recurrence.

"All employees who become sick while at work are sent to the doctor's

office for a 'pass' before going home. And all employees absent on account of illness, of even one day's duration, must secure a permit from the physician before returning to work. By this rule, the medical staff is enabled to watch those employees most frequently absent on account of illness and thus quite often some incipient disease is revealed as the cause of this decreased working capacity.

"Out of 666 cases recently examined, 85 were rejected for the following reasons:

Active tuberculosis	11
Suspicious	10
Tubercular glands of the neck	2
Heart trouble	7
Anemia and chlorosis	12
Epilepsy	2
Bright's disease	9
Diphtheria	1
Cirrhosis of the liver	1
Venereal diseases	7
Hernia	4
Physical defects	10
Sick, no definite diagnosis	9
Total	85

"Out of 500 applicants for their Mutual Benefit Association, 43 were rejected for the following reasons:

Tuberculosis	7
Heart disease	9
Bright's disease	6
Goitre	8
Diabetes	1
Anemia and chlorosis	4
Physical defects	8
Total	43

As a supplement to medical examination of employees, the following medical work is carried on by Sears, Roebuck Company:

They are constantly on the watch for employees below par.

Reëxamination of new employees reveals many suspicious cases which are watched and checked at frequent intervals.

All sick people are sent to the dispensary before being allowed to go home.

All sick employees must report to the dispensary and obtain a permit before being allowed to return to work.

The visiting nurse discovers many things. When an employee stays out longer than one day, the case is referred to the visiting nurse.

Circular letters and talks are very good in stimulating coöperation. The foremen, as the result of these talks, soon learn to detect cases themselves.

Every individual who visits the dispensary has his temperature, pulse and weight taken.

When a tuberculous person is found, those working near the individual are carefully examined.

In 1913, there were 101 cases of tuberculosis found by Sears, Roebuck Company. These were located through the following channels:

Those seeking employment	22
Applying to the Benefit Association for membership	7
Located by the foremen of departments	28
Sick employees referred to the doctor's office	20
Found by nurse	13
Referred by family physician	3
Reported by patients themselves	3
Miscellaneous	5
Total	101

The question naturally arises as to what will happen to the defective laboring man when all manufacturing organizations have instituted medical and physical inspection at time of employment. It means simply two things: if the employee becomes defective while engaged, his employer will devise some way of bringing him back to normal, if possible. This will be necessary, as good health has considerable bearing on accident prevention. A sick person lacks the quickness often necessary to avoid accidents, lacks concentration on the task immediately in hand due to brooding over ill health. This also accelerates the accident rate. All these things, coupled with a feeling of responsibility, make the employer use methods to cure the employee or pension him if beyond cure. The second thought concerns the defective who seeks mechanical employment but who is unable to secure it because of his physical condition. It simply means that such men will either be employed through some undeveloped system in

which they will carry their own accident risk, such as signing a waiver which has a legal standing; or it will be necessary for them to engage in other occupations where the danger from accidents is small and which are not included in workmen's compensation systems. Some economic system will necessarily have to be developed which will not make these people a charge on the community. It is rather interesting to note the methods used by some of the large organizations to handle the serious cases of sickness which develop among their employees.

Tuberculosis.—This disease is particularly hard to locate among employees due to several things: a tuberculous employee is usually secretive, realizing that if his fellow-workmen know he is afflicted he will be let alone. He is usually optimistic and feels that his trouble will soon clear itself. He has a natural aversion to leaving his family and being isolated at a tuberculosis camp with others in worse condition than himself. For this reason, home treatment is to be preferred where it can be carried on under the supervision of a visiting nurse. Another unfortunate habit develops, sometimes, when this individual has been kept at a camp for six months and has gotten into the habit of not working and of being cared for at no expense to himself. This creates a habit of not wanting to work and the person whom at first it has been extremely difficult to persuade to enter a tuberculosis camp, does not care to leave. To prevent this habit from being developed, some companies have gone to the extreme of providing open-air workrooms on their roofs where tuberculous employees may continue their regular tasks, being clothed with sufficient warmth so that they may work in the open. This appears to be an excellent scheme as it provides the patient with sunlight and fresh air, making it simply necessary for him to have open-air sleeping quarters at home and good wholesome food. It also does not impair his earning capacity, keeps a contented state of mind, prevents him from being a charge on the community, and enables him to retain in a large measure his status in society.

Pittsfield Tuberculosis Camp.

The writer has come into contact with many tuberculosis cases and his experience simply bears out that of others, if you can locate tuberculous patients in the early stages of the disease, in almost every case the disease may be arrested and the person restored to practically normal condition. Worry, lack of proper food, lack of fresh air, and dissipation are the principal causes of tuberculosis.

Where such welfare work is being carried on in our large organizations, it is being done with as little publicity as possible; the employee in many cases leaves one department, remains away till cured, and, upon his return goes into another department without others being cognizant of what has taken place. This is the proper way of carrying on this work.

Many unfamiliar with the nature of tuberculosis have a mistaken notion of the danger of living at a sanatorium and of working with an employee who has an arrested case of tuberculosis. The following letter from the late Dr. J. F. A. Adams, a well-known specialist on tuberculosis in Pittsfield, Mass., is instructive in this connection:

"We are pleased to note in the community an increase in knowledge of the nature of tuberculosis and of the means of prevention; but, from the imperfection of such knowledge, certain misapprehensions have arisen. One of these is an excessive fear of infection. We sometimes find patients afraid to go to a camp or sanatorium because they believe the presence of other patients will be a source of danger to themselves. We wish to assure those who have this dread that a tuberculosis sanatorium is the safest place in the world. In such an institution the care taken to destroy all sputum and to prevent promiscuous spitting, renders infection almost impossible, for which reason we consider our camp a safer place than North Street.

"Moreover, there is no danger from living or working with a consumptive in whom the disease is arrested and who has ceased to cough and expectorate. Even one in whom the disease is still active, but who has been instructed at a sanatorium and carefully follows the rules he has learned there, is not a public danger. An ignorance of these facts has made it unnecessarily difficult for a cured or careful consumptive to obtain work or board.

"Owing to the systematized way in which the anti-tuberculosis campaign is being carried on, state-wide, nation-wide, and world-wide, the death rate from this most destructive of diseases is steadily declining.

This decline is sufficient to give us confidence in the ultimate success of our efforts, but not sufficient to justify us in relaxing our vigilance. One of the greatest obstacles which we encounter is the tendency to become lukewarm in the cause, among those who are not brought into personal contact with this disease. For this reason it is necessary to bring the subject, over and over again, to the public attention and to do everything possible to keep alive a widespread public enthusiasm."

On behalf of the Executive Committee,

J. F. A. ADAMS, M. D.,
President.

Pittsfield, Mass., May 23, 1913.

The experience of the International Harvester Company in tuberculosis work is given by Dr. James A. Britton in the following paper:

"The primary object of the work undertaken by us was to discover all cases of tuberculosis and to start proper treatment as early as possible. The work is now developing into a system of study of all physical disabilities of employees, with the object of the early detection of any disease and locating and correcting conditions shown to be responsible for disease. It is not a move on the part of employers to 'weed out' poor workmen, but to safeguard the well man and to bring back health to the others. Positions are found for all who regain health sufficiently to return.

"Beginning with the International Harvester Company, the movement has spread rapidly, and at present has been taken up by firms in Chicago representing over 100,000 employees. While it is impossible at this time to report on the results of this work with other companies, and while it is difficult to measure increased efficiency, I am able to report on the work done by the Harvester Company which has resulted in:

1. A marked decrease in the number of cases of tuberculosis.
2. Constant improvement in factory conditions affecting health.
3. Consequent improvement in the welfare of the workers by:
   (*a*) Many workers restored to health.
   (*b*) Less illness.
   (*c*) More steady employment.

"The routine at first instituted consisted in a careful examination of all employees who for any reason were thought to be tuberculous. The present routine consists of (*a*) a careful examination of all prospective employees, (*b*) a yearly 'inspection' of all those working and (*c*) a careful reëxamination and periodic reinspection of all those who for any reason are found from time to time to be below normal.

"The physical examinations are thorough in the ordinary medical sense, with examination of blood, urine, and sputum if indicated. These examinations are made in the doctor's office. which is provided for the purpose.

"The 'inspections' are superficial examinations, including weight, temperature and pulse, general appearance and history. These inspections are usually made in the office of the department in which the employee works.

"The result of three years' more or less careful supervision of health so far as tuberculosis is concerned, of the group of about 20,000 Harvester employees in Chicago, is illustrated by the following figures, in which are included all cases of known bone and glandular tuberculosis as well as pulmonary tuberculosis, and they are included regardless of whether the disease is open and active or apparently arrested:

"There was found in the year ending August 1, 1912, a ratio of 88 cases of tuberculosis per 10,000 employees. In the following year, with a more careful inspection of the same group, the ratio of cases found was only 54 per 10,000 employees, while the current fiscal year, with still more extensive and careful effort to discover cases, thus far promises a ratio of less than 45 per 10,000.

"As compared with the prevalence of tuberculosis in Chicago, as a whole, these figures are much lower than the most conservative estimates made by those in position to judge. The most conservative figure given is from 90 to 100 per 10,000 population of active cases of tuberculosis, while an estimate of 200 per 10,000 would hardly be large enough if all were included, regardless of condition or type of the disease, as in the figures for the Harvester Company. Our experience with this group of Harvester employees thus indicates that tuberculosis is not more than one-fourth as prevalent among these industrial workers as it is throughout the community as a whole.

"Some of the improvements in shop conditions which were made with the sole object of improving the health of the workers include:

"1. Extensive ventilating systems, and

"2. Dust-removing systems.

"3. Sanitary drinking fountains, wash basins, toilets and shower baths.

"The definiteness with which unhygienic conditions are pointed out by the system of medical examinations is illustrated by an analysis of the cases of illness according to shop departments. It was found that while in one department employing 700 men there was only one case of tuberculosis in two years, there were other departments in which the number of cases considerably exceeded the average for the whole plant and approached the average for the community.

"At the time this work was begun little thought was given to conditions among office employees, yet when 400 of these employees were

examined, a rate of tuberculosis was found higher than the average for the shop departments. This condition was found to be due, not to unwholesome office conditions, but to the general physical type of office employees as compared to those doing manual work, and served to emphasize the special need of medical supervision for office workers as well as those in the work shops.

"The question arose at the beginning of this work, and has arisen again and again with each new firm which has undertaken such work, as to the attitude of the employees toward medical inspection. In a total of over 20,000 examinations and inspections of Harvester employees, covering a period of nearly three years, there were not to exceed 20 employees who objected and most of these 20 willingly submitted to the examination after the purposes had been carefully explained to them. Again, the coöperation of the employees is shown in their attitude toward sanatorium care. Each employee who is found to have tuberculosis in an active stage is urged to consent to go to a sanatorium where he will get proper treatment. The Harvester Company coöperates with its Benefit Association in sharing with the employee the expense of sanatorium care and, when necessary, aids in caring for the family so that the patient may be relieved of worry and be afforded the most favorable conditions for recovery.

"During the first year of this work only 40 per cent. of those who needed sanatorium care would consent to go, while during the second year this percentage was increased to 60 and during the present year the number taking advantage of the opportunity to get sanatorium care will be over 80 per cent. of those needing special care.

"If it is honestly shown that, in this plan for gaining a knowledge of the health conditions among employees, the effort is one intended to improve conditions and to help those who develop illness back to good health, and not a means of simply eliminating individuals, the willing coöperation of the employees can be assumed.

"The advantages of the medical examination can be summarized as follows:

"1. An early discovery of disease greatly increases the possibility of cure, and usually guarantees a shortened period of disability.

"2. The knowledge of the existence of any disease makes possible a reduction of contagion and, consequently, a reduction of those disabled.

"3. If the number of cases and the exact working places of those developing a given disease is known, it is possible to judge the relative importance of the various health factors in an occupation.

"It is then evident that this system of medical examination can be made the basis of great economic service to the employee as well as the employer, and through both these, to the community."

Hernia (Rupture).—The question of handling hernia cases is one which is affording considerable concern to industry at the present day. Some companies are operating on all cases they discover in their employees—whether through cases becoming aggravated and being reported to the company physician, or being discovered through medical inspection of old employees. The idea of operating on all cases does not seem exactly wise, as there

Incorrect and correct way of lifting.

are some cases which will not stand being operated upon, in which an operation would be fatal.

Medical statistics show that it is impossible for a rupture to occur to an individual who is not born with a small puncture in the peritoneum, irrespective of how severe the work may be. A strain may result, but not a rupture. The strain may aggravate a rupture, but it will not cause it. Where a tendency to hernia exists, the weakness reveals itself under physical examination.

Dr. C. A. Lauffer, of the Westinghouse Company, discusses as follows on this subject:

"Hernia (rupture) is not an accident, though often so regarded by the patient. The location of the points of imperfect closure in the abdominal wall are well known to surgeons. It is due to imperfect closure that a man develops hernia. A surgeon can safely predict in whom it will arise by a careful physical examination. Yet many cases of hernia, where the rings are large and have long been patent, are reported as accidents."

"Hernia" by Dr. D. H. Keller:

"Hernia is defined as the protrusion of a viscus (organ) through an abnormal opening in the wall of the containing cavity.

"There are a great many varieties of hernia, the abdominal hernia occurring most frequently. A hernia is the outward and visible proof that an individual was born with a hole in his abdomen which, though it should have closed, did not close before birth. Without fear of proof to the contrary, the author declares that no man who ever lived, who was born and reached the age of fifteen minutes without the presence of an abnormal hole in his abdominal wall, ever sustained a hernia through any force suddenly applied, no matter how great, unless that force was accompanied by a penetrating wound at the point in the abdominal wall where hernia appears. (We are, of course, discussing abdominal hernia, and especially inguinal hernia.)

Why Not More Victims?

"Let us take into consideration these facts: Thousands of men of all ages, from fifteen to sixty, are engaged every day in such occupations as baggage handling, logging, structural iron working, stone masonry, acrobatics, and the like, occupations entailing the maximum of muscular effort sustained over the maximum of time. Why, please, if extraordinary muscular effort is a cause and a sole cause of hernia, are not all or nearly all of these men victims of hernia? If the 'jar' incident to a misstep from a stairway or a street car be a cause and a sole cause of hernia, why, please, are not all high jumpers victims of hernia? If lifting one trunk or one stone one time is a cause and a sole cause of hernia, why, please, are not all baggage handlers and all stone quarriers victims of hernia?

Bones Broken: No Hernia

"There are on record statistics relating to the violent deaths of a great many aeronauts, parachute artists, bridge jumpers and the like who, when examined, after falls from great heights, have been found to have sustained fractures of every bone in the body, and not in one instance has one of them sustained a hernia.

"If we need authorities for the above facts, it is not difficult to find them.

Carrying an object properly.

Raising heavy object—such as lifting from floor to truck or shelf.

Always Developed Gradually

"Herman Tillmans, University of Leipsic, 'Text Book of Surgery,' says:

"'Traumatic hernia is not true hernia. The hernial sac—that is the true hernia—is always developed gradually, although an injury may, of course, act as part of the exciting cause. The supposed sudden development is always dependent upon a mistake in observation. The hernial sac, as a rule, is always present, but is empty, or the hernia already present at the time of injury was so small as not to have been noticed. I, therefore, agree with Socin that a hernia, from medico-legal point of view, is not to be designated exclusively as an "injury."

Muscles benefited by exercises outlined—raising 80-lb. bell.

The herniæ supposed to have arisen "suddenly in consequence of an injury" are in a part a result of the traumatism, but are due in part to a special condition of the body of the injured person which already existed.'

"Dr. George Sultan of Prussia, 'Hernia,' American Edition, edited by Dr. George Coley, Professor of Surgery, College of Physicians and Surgeons, New York, says:

"'In the critical examination of a casual relation between hernia and accidents we must remember first of all that a hernia, complete in all its parts, can never arise at the moment of an accident, or by a single augmentation of the intra-abdominal tension, be it ever so great. If the hernia first appears at the time of the accident, we may certainly suppose that the hernial sac was either congenital or gradually formed in the

manner already described. Although it must be unconditionally accepted that a hernia making its appearance at the time of the injury has never completely developed at that moment, a casual connection must nevertheless be recognized, since a preëxisting condition has been made worse by the accident or injury.'

"Dr. J. Chalmers De Costa, Professor of Surgery, Jefferson Medical College, says:

"A sac may exist for years and yet remain empty. When bowel or omentum enters it from some strain or effort, the parts were long prepared to receive the extruded mass. This extrusion may occur gradually; it may occur suddenly. If it occurs suddenly the sufferer believes that his hernia was formed then and there, but as a matter of fact, the extrusion of bowel or omentum and its entrance into the sac are but the last of a long series of antecedent and preparatory changes. Finally, a hernia appears, and usually does so during effort."

"William McAdams Eccles, 'Hernia,' says:

"'In the majority of cases, a hernia is of gradual and slow formation and this without any tearing or breaking of tissue, such as is clearly indicated in the use of the word "rupture." Thus it will be seen that the formation of the sac or hernia is a slow process, for the parietal peritoneum will neither stretch nor prolapse sufficiently to produce a sac in a day or even in a week or two; in fact it usually takes months for the sac to become really apparent.'"

Rulings of the Ohio Accident Board on Hernia.—Medical science teaches, and has taught for the past twenty years, that which is now accepted as a medical and scientific fact, being corroborated as such by the foremost surgeons of the world, *i.e.*, that hernia (or so-called rupture) is a disease which ordinarily develops *gradually*, being, *very rarely*, the result of an accident.

For the purpose of treating the subject of hernia in a manner just to both the employee and the employer and to be in accordance with medical facts, the Commission rules the following:

RULE I.—Real traumatic hernia, namely, that produced by a force great enough, that when directly applied to the abdominal (or belly) wall, results in either puncturing or tearing the wall asunder, full disability, as approved by the Statute, will be allowed.

RULE II.—All other hernias, whenever occurring or discovered and whatsoever the cause, except as under Rule I, are considered to be diseases causing incapacitating conditions or permanent partial disability and the causes of such are considered to be as shown by medical

facts, to have either existed from birth, to have been of years in formation and duration, or both; and are not compensatable except as provided under Rule III.

RULE III.—All cases coming under Rule II, in which it can be conclusively proven: First: That the immediate cause which calls attention to the hernia present, was such as a sudden effort, severe strain or bruise. Second: That the descent of the hernia occurred immediately following the cause. Third: That the cause was accompanied or immediately followed by severe pain in the hernial region. Fourth: That the above facts were of such severity that the same were noticed by and communicated immediately to one or more persons; are considered to be aggravations of previous ailments or diseases and will be compensated as such for time loss only and to a limited extent, depend-

Floor exercises to strengthen abdominal muscles.

ing on the nature of the proof submitted and the result of the local medical examination. A reasonable amount will also be allowed for a properly fitting truss.

Cases coming under Rule II will not be considered to be entitled to compensation from the State Insurance Fund for amounts to pay for permanent partial disabilities or for special medical services rendered, such as a surgical operation and hospital attention; otherwise, the employer would be paying for the cure of a permanent partial disability which existed, and the real causes of which existed, prior to the enactment of the Workmen's Compensation Act.

The Prevention of Strains and Ruptures.—An article prepared by Mr. F. H. Baker: (Current News).

"It is not our purpose to go into medical detail regarding this subject; and the remedy or operation for hernia must be left with the surgeon. What we hope and aim to do is to show in a concise way the causes of hernia and how it can be prevented, as we believe in the old maxim that, 'An ounce of prevention is worth a pound of cure.'

"There are different types of hernia, due to their location and stages,

i.e. femoral (thigh), umbilical (navel), and inguinal (groin), which determine the location, whereas strangulated and sliding indicate the condition reached.

"One may bring on hernia by severe coughing, crying, straining and lifting—lifting heavy objects from the floor is the most common way.

"The abdominal walls may be thin, the muscular covering not properly developed, and upon a sudden strain from any of the causes just mentioned, hernia might result.

"The preventive, then, is obvious. Thicken the abdominal walls by developing a strong muscular covering which is accomplished only by systematic physical exercise. This will require but a few moments each day, before retiring at night and just after rising in the morning. The exercises will develop and strengthen the abdomen and also stimulate the activity of the bowels, thereby eliminating the use of purgatives, which in time leave the organs in a weakened condition.

"Again, in lifting an object from the floor one may get into an improper position for the effort which, in itself, without the abdominal muscles being necessarily weak, would be sufficient to produce a hernia.

"The illustration, page 85, represents the right way of lifting. First, be sure that the feet are placed well apart so as to give a firm foundation and poise of body. Also, the object to be lifted should be as nearly as possible in a line between the feet. Now squat over the object, taking firm hold of it.

"In this position note that the chest should be well out, shoulders squared, and head back. The line of the back should be straight and nearly vertical.

"In lifting, power is received from legs, thighs, arms, back, chest and abdomen. The entire muscular system is coöperating in such a manner that the object is lifted from the floor with no undue strain upon any particular muscular group or part of the body, and the largest groups of muscles as well as the smaller are properly proportioned to the load.

"In the first figure is shown the wrong position for lifting. (The average man brings his feet closer together than is shown in the illustration.)

"It should be observed that the feet are placed too far in back of the object. This necessitates rounding the back and brings the entire strain directly upon the abdomen. The only lifting power is obtained through the forearms. A great many men, when finding weight too heavy, or slipping from their grasp, will raise one leg and thigh to hold it momentarily. This is a serious mistake. The foundation is destroyed and the abdominal muscles are thrown into a strained and cramped position, so that everything is now favorable, with a slight wrench or lifting effort, for the production of hernia.

"Remember always, to keep the abdomen *in* and the chest *out* in

Ohio Iron and Steel Company, Lowellville, Ohio. Interior of first aid room.

Cadillac Motor Company, Detroit, Mich. Emergency hospital in main plant.

any position for lifting or pulling, the back arched *in* and the feet *out* and one can't go far wrong.

"The third and fourth figures illustrate the position which should be taken in lifting an object from the floor to be raised to shoulder height, as when loading on a truck or platform. Note the poise of body, the feet placed well apart for a good foundation, back arched and chest out. The third figure also illustrates the proper position for carrying weights short distances. (See page 87.)

"Physical training, in its best sense, is not the cultivation of great, heavy muscles, but the culture of the nervous organism. It has been well said that great muscular power is not always a fair guarantee of great vitality. It is not necessary, nor desirable, for the ordinary man to strive to be a Hercules or an expert gymnast, as it is not required in his walk of life.

"Our purpose is to lead a Christian, virile life, a profitable, happy life, to possess manhood in its fullest sense and to develop a clean, wholesome, vigorous body. We aim for vitality, physical and mental efficiency through the development of organic power, and we wish to impress upon every one the social and moral value of athletic recreation and the habit of physical exercise.

"We sincerely hope that all of the men and boys who read this article will strive for the same purpose and aim for that which makes for all-round efficiency."

CHAPTER IV

Emergency Hospitals and First Aid Work

Wonderful progress has been made in recent years by the large industries, in the matter of installing emergency hospitals for the care of the sick and injured, and in the general instruction of their employees in first aid work. The American Red Cross has conducted many classes throughout this country in first aid work. Many of our large railroads maintain first aid cars which go from place to place instructing the general public in first aid work, the car usually being equipped with camp chairs, charts, and sometimes arranged for moving-picture work, a physician being in charge. The usual practice among the large corporations where physicians are available is not to train employees in other than the simple first aid work: to stop bleeding, to put on simple bandages, resuscitation work, care of a person suffering from nervous shock, removing simple particles from eyes, and care of nail punctures. Where physicians and surgeons are not readily available, it becomes necessary to train first aid men in the handling of fractures; but as a usual thing the surgeon would prefer to have the individual placed on a stretcher or in an ambulance and brought to the emergency hospital or to his office, rather than have a half-trained first aid man attempt too much, necessitating doing the work over. In the case of putting on a tourniquet to stop excessive bleeding, unless the greatest care is used, it will often do more harm than good. Particular care should be taken in placing a tourniquet not to use wire or anything that will cut. The Esmark triangular bandage, with something like a round piece of stone, wood, etc., wrapped up in the tail of the bandage and used to apply pressure, gives the best results. When a tourniquet has been applied, every

Male ward—Pittsfield Works Emergency Hospital.

Female ward—Pittsfield Works Emergency Hospital.

fifteen minutes the pressure should be released, so as to give the blood a chance to circulate, and then pressure should be applied again. Great care should also be taken not to injure the eye while removing particles from it.

The equipment of emergency hospitals should be simple, the attached illustrations showing the equipment of the emergency hospital of the Pittsfield works of the General Electric Company, giving a fair idea of the necessary equipment. The following description covering the operation of this hospital, detail of a simple first aid jar and a discussion of first aid in cases of severe illness may be of interest.

Emergency Service.—The emergency service for the care of the sick and injured at the Pittsfield works has been very carefully developed over a period of several years and at the present time it seems to be quite efficient. The emergency hospital, centrally located, is equipped with two rooms, one being used by male patients and the other by female patients. The female nurse and welfare worker has general charge, following up all accidents, re-dressings, and sickness in a thoroughly systematic manner. An ambulance is in readiness for service at any hour of the day or night. The hospital handles only emergency work, as the works have relations with a local surgical hospital where all cases requiring more than temporary treatment are cared for. Instructions are posted at convenient places about the plant covering care of sickness and accidents, and in every building the emergency service is supplemented by one or two "first aid jars" shown in the illustration. These jars are made of glass, are sanitary and may be used in emergency for carrying water. They are equipped with liquid soap, bichloride solution, aromatic spirits of ammonia, adhesive, boracic acid solution, tincture of iodine, absorbent cotton, small scissors, drinking glass, gauze and bandage. When a person is cut and is bleeding, the contents of these jars are to be used to bind up the wound so that the patient can come to the emergency hospital.

There are two types of jars used, one for the factory and one for the home, the latter of which is described later.

In all cases where a bandage is placed to bind an injury,

Equipment male ward—Pittsfield Works Emergency Hospital.

Sanitary method of making a bandage.

the individual must report to the hospital, where the wound is re-dressed in a thoroughly sanitary way. In this manner it is possible to keep down cases of infection. Out of a

thousand cases that may be treated at the hospital it is seldom that one case of infection subsequently develops. There are cases, however, in which an individual will remain away from the hospital for two or three days, after the wound has occurred, and in this manner an occasional infected case comes up. It requires constant following up to see that the foremen report all cases as

Automobile ambulance—Pittsfield Works Emergency Hospital.

soon as they occur. Some men seem to have a dread of going to a hospital of any kind, but it is found that by giving safety talks among these men, and by having our female nurse participate in the demonstration, greater confidence is developed on the part of the men and there is less reluctance on their part to go to the hospital. If at any time an accident should occur when our emergency service from the hospital could not respond promptly enough,

there are all the materials in the first aid jars in the various departments to make good sanitary dressings. The first aid jar used was modeled after the first aid jar developed by the Norton Emery Wheel Company, except that our jar is a little larger.

First Aid in the Home.—At one time the writer had occasion to give a talk on "First Aid for Rural Communities," to a large gathering of teachers from different parts of the South. The idea was to get together a first aid jar, which would not exceed in price 65 cents, which could be placed in the country schools, where instructions could be given to the school children on first aid methods, so that they in turn would install similar jars in their own homes.

With this idea in mind the first aid jar about to be described was used in giving simple demonstrations to teachers from about 1,000 different communities of the South.

The jar shown in the illustration is made of glass, a tobacco jar, and can be purchased at the five-and-ten-cent store for 10 cents. The idea of using glass is twofold; first, it is sanitary, can be kept clean, and the contents of the jar are always visible. Secondly, it can be used in emergency to carry water, the contents of the jar being readily removed.

The jar should contain a small bottle of tincture of iodine which can be bought for about 10 cents. As tincture of iodine is a poison, care should be taken to see that it is kept away from the reach of children. There is probably no substance which has done so much in recent years to reduce infection as tincture of iodine. In many of our manufacturing industries, subsequent infection from wounds has been reduced well over 95 per cent. since first aid instruction has been given and since tincture of iodine has been used freely.

The second article that the jar should contain is boracic acid. Five cents' worth of boracic acid can be purchased in a drug store, one-half a teaspoonful being used to a glass of boiling water. It is necessary to have the water boil-

ing so that the boracic acid will dissolve. A 10-cent bottle of aromatic spirits of ammonia should likewise be included in the jar.

The jar should contain a few toothpicks and a small

First aid jar for the home.

Contents of first aid jar.

bundle of absorbent cotton. It should also contain a small pair of scissors, which can also be purchased for 10 cents. It is not necessary to have in the jar the tincture of green soap used in the larger jars; this is used in manufacturing

industries for washing wounds, as an ordinary beginner should not handle a wound too much. A wound should simply be washed in warm water and some of the tincture of iodine dropped into the wound. Neither is the bichloride solution necessary. It should contain a small roll of adhesive, which can be purchased for 10 cents; two bandages, one inch and one-half inch, which can be purchased for a few cents.

The welfare nurse at the Pittsfield Works has found it possible to put the entire jar together as shown in the illustration for 65 cents. We sometimes add a bottle of spirits of camphor, a few drops of which in sugar forms a good preventive for colds.

Cuts.—All cuts should be washed with a little warm water and dried with a piece of absorbent cotton. In the wound should then be placed a few drops of tincture of iodine. The wound should then be bandaged—not too tightly—and the part which has been injured should be kept out of water. After the bandage has been put on the wound, it can be held in place by a few strips of adhesive.

Nail Punctures.—As nail punctures are so likely to have serious results, unless properly cared for, a repetition of the method of treatment is not amiss. It is quite important that a wound from nail punctures should be kept open until healed. If this is not done and the wound is at all infected, a small abscess will form at the bottom of the wound, which is likely to result in blood poisoning. Such a wound may be kept open in a very simple manner, if the wound has been cleaned as previously described and a drop or two of iodine has been placed on the surface to prevent all possible infection. A small pad wet with boracic acid, known as a compress, should then be placed over the wound. A small piece of oiled paper, such as we use to wrap meats up with, and which likewise can be purchased in the five-and-ten-cent store, can be put over this compress before it is bandaged. In about three or four hours a new compress, freshly immersed, should be put on the wound. If the wound is carefully scrutinized the next morning it

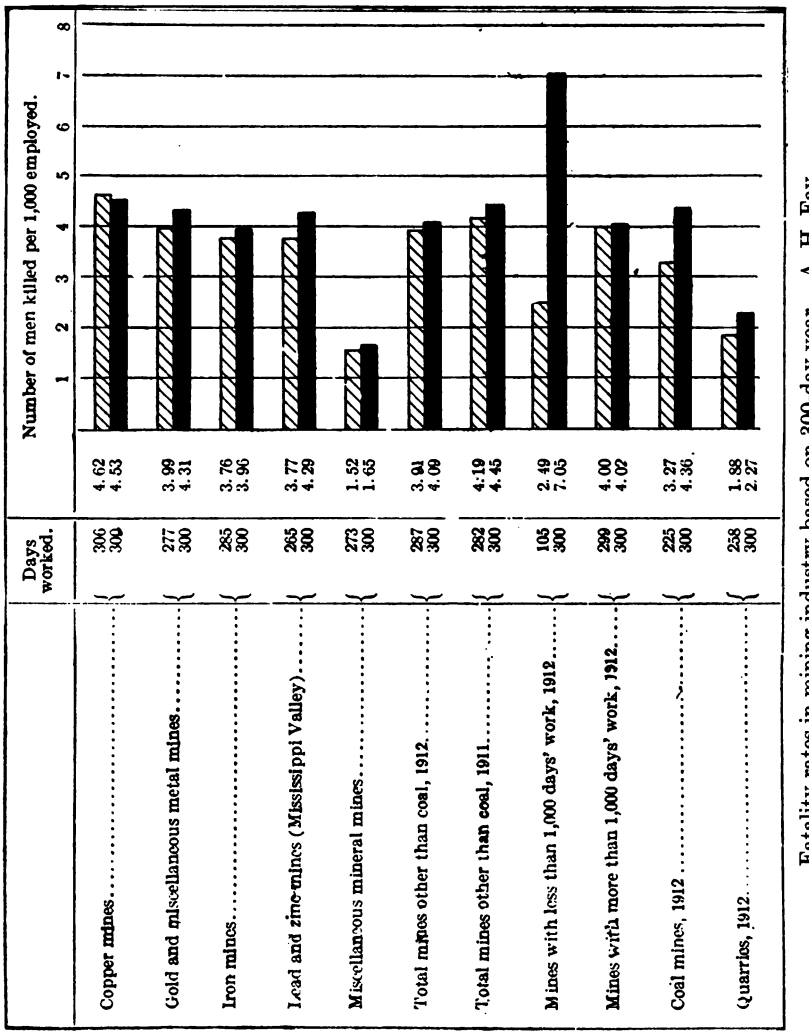
will be found that a very small hole, about the size of a pin point, is all that will be left of the nail puncture; but if this is kept moist by means of compresses, allowing the wound to heal up from the bottom, within a few days the wound will be entirely cured, without serious trouble.

Particles in the Eye.—Unless one is thoroughly experienced in removing particles from the eye it should not be attempted. There are times when one will see workmen trying to remove particles with a jack-knife or some other clumsy instrument. Many eyes have been lost by these

Nurse removing particles from eye.

Nurse bandaging hand.

crude attempts, and in all cases where an article, such as a cinder, is embedded in the cornea of the eye, it is better to have a specialist remove it. Where dust or dirt is loose, however, and is on the eyeball, it can usually be removed by taking a swab of cotton and wrapping it around the end of one of the toothpicks from the first aid jar, moving this carefully over the eye, holding the eyelid back as shown in the illustration. Where the cinder or dirt is located under the eyelid, it is necessary to place something, such as the prong of a bone hairpin, on the eyelid, and turn the lid back over this.



	Days worked.	
Copper mines	306	4.62
	300	4.53
Gold and miscellaneous metal mines	277	3.99
	300	4.31
Iron mines	285	3.76
	300	3.96
Lead and zinc mines (Mississippi Valley)	265	3.77
	300	4.29
Miscellaneous mineral mines	273	1.52
	300	1.65
Total mines other than coal, 1912	287	3.91
	300	4.09
Total mines other than coal, 1911	282	4.19
	300	4.45
Mines with less than 1,000 days' work, 1912	105	2.49
	300	7.05
Mines with more than 1,000 days' work, 1912	299	4.00
	300	4.02
Coal mines, 1912	225	3.27
	300	4.36
Quarries, 1912	238	1.88
	300	2.27

Fatality rates in mining industry based on 300-day year.—A. H. Fay.

Fainting.—When a person feels faint or when it is necessary to stimulate the heart action, first lay him on his back with his head low. Then give a half teaspoonful of aromatic spirits of ammonia solution in a half glass of water; also place the individual where he can receive fresh air. Where the person has become entirely unconscious, it is desirable to saturate a small piece of gauze with the aromatic spirits of ammonia, and apply it to the nose.

Burns.—As soon as a burn occurs it is desirable to have the wound covered immediately with some kind of oil, such as carron oil (linseed oil and lime water) or borated vaseline. Where the burn pains badly, a solution of bicarbonate of soda applied to the injured part, will remove considerable of the sting. Extensive burns are now being treated in industry by having the patient lie on a sterile sheet under a tented cloth, powdered stereate of zinc being dusted over the burned parts.

Conclusion.—Some of the materials mentioned in the above list of treatment are not included in the first aid jar.

When first aid treatment is necessary in a home, the articles necessary are usually missing, which shows the necessity of having some of these things assembled in the form of a compact first aid jar indicated in the illustration.

First Aid in Cases of Severe Illness.—Serious illness is something which may happen as a result of an accident, some chronic disorder, general debility, or nervous shock. In caring for anyone in a critical condition there are a few well-tried rules of nursing that all first aid men should be familiar with.

Treatment of Shock.—A person may receive what we term a "shock" from many causes. When in this state a person's condition is quite serious. The circulation becomes poor, the hands and feet become cold, the pulse becomes weak, nausea sets in, the patient becomes either frightened or utterly collapses. A shock sometimes comes from such a simple thing as a minor cut; other times it may come from the loss of a quantity of blood. In any case, prompt action is necessary. The patient should be laid on

his back, in bed if possible, the foot of the bed raised so as to send the blood from the lower part of the body toward the heart. The temperature of the body should be raised by hot water bags at the feet, the most efficient condition being head cool, empty stomach and intestines, and warm feet. The patient should be constantly massaged (see details later). It will be found by proper massage that the pulse can be strengthened considerably. *It is well to bear in mind that when a patient is very weak, it is possible to give him some of your strength through proper massaging.* Keep the patient quiet by all means. Visitors should not be allowed in the sick room under any consideration, although this statement might be modified by having someone at the bedside whom the patient cares for, who can talk in a gentle tone, but who will not engage the patient in conversation. *It takes strength to talk.* Have plenty of fresh air in the room, but the patient must be kept out of a draught.

Fresh Air.—All physicians recommend fresh air as a tonic, but few of us ever realize, except after some critical experience, the wonderful curative values of fresh air. If it were possible for us to live continually in the fresh air, not only in the day time but at night, sleeping under some protection but still so that the fresh air could be breathed freely, we would be subject to a very small percentage of the ills that we are now prone to. Fresh air is a wonderful tonic for all kinds of nervous disorders and when people who are seriously ill can be bundled up and placed in the fresh air all day long, and at night, where possible, under a sleeping porch, the curative effects are really remarkable. In cases of severe illness it is well to bear in mind, therefore, that just as soon as possible the patient should be moved into the fresh air. This does not imply walking up and down stairs and performing other exercises which require energy, but providing some means without undue exertion, of placing the patient in the open air.

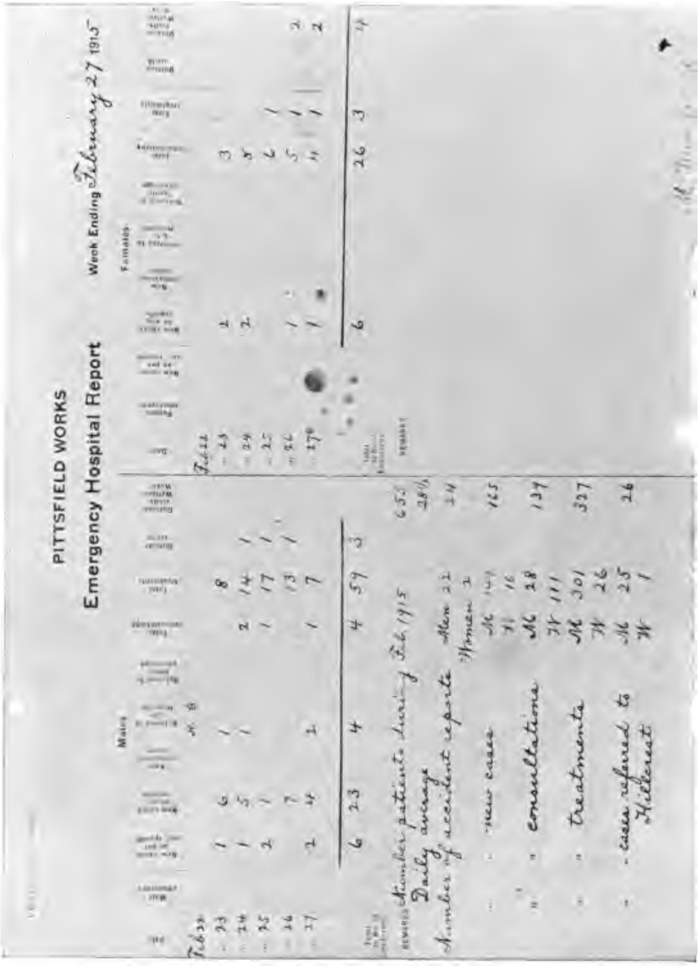
Sleep.—It is vital, in all cases of sickness, that a patient should sleep, but if a patient does not sleep it is necessary to use sleeping powders to make the patient sleep, even

though their after-effects are bad. It is possible, many times, by having a bedroom dark at night, by keeping the patient free from pain and by effectively massaging him, to make him sleep. Sometimes it is necessary to massage him for three or four hours before it is possible to get him to sleep.

Rubbing.—All first aid men should learn how to give an effective massage. The principle of efficient massaging is easily learned after one or two illustrations. The hand,

Accident report used at Pittsfield Works.

preferably the right hand, should be placed on the body, sufficient pressure being exerted so that when the hand is moved, the skin will tend to cling to the hand. Sometimes it is necessary to massage lightly, other times vigorously. The pressure should not be so great, however, as to irritate the skin. Massaging should be done in a clockwise direction on the upper part of the body and on the lower part, the massaging should be done from the feet up, bearing in mind in all cases, that the blood should be forced toward the heart. The motion should be rhythmic and should be slow. Alcohol, witch-hazel, talcum powder, cocoa butter, can be used advantageously under the hand.



Weekly report of hospital work—Pittsfield Works.

Where it is desirable to stimulate the heart action or give strength, alcohol is preferable. Where parts rubbed over are tender, the massaging should be light and talcum powder may be used. Where, however, one is desirous of producing drowsiness, cocoa butter seems best to produce the desired effect. Oftentimes where a patient is nervous and where the body twitches, prompt massage can quiet him.

Diet.—When a person is first taken sick, do not be in a hurry to give nourishment, and also do not give any more medicine than is absolutely necessary. Hot water with a little listerine in it, hot water with lemon juice, are good things to use at the start. If the patient is faint, a half teaspoonful of aromatic spirits of ammonia in a half glass of water is an effective stimulant to use. After the first twenty-four hours a liquid diet may be started. This will consist largely of milk shake, broths and soups, and other foods of similar character. Pea soup is excellent to use, as this contains considerable nourishment and does not produce a tendency to nausea as heavier soups sometimes do. Where a liquid diet is used, the patient should be fed about every two hours. If the intestines should not perform their normal function, an enema may be given to clear the intestines. Where such is used, a salt solution—a tablespoonful of salt to a quart of warm water—will not only perform the desired result but will also act as a stimulant to the heart. After the first few days the diet can be added to, using such things as soft-boiled eggs, poached eggs on toast, baked potatoes, milk toast, meat juices, and food of a similar nature.

State of Mind.—The *state of mind* of a sick person has considerable to do with his rapid recovery. If he can be freed from worry, be made comfortable, kept quiet, made to take a little nourishment and can succeed in getting a fair amount of sleep, have access to the air and plenty of it, he stands a very strong chance of recovery. The human body has wonderful recuperative qualities, and where nature is assisted in this work, no matter how slightly, the patient's recovery is fairly rapid in most cases.

CHAPTER V

Records, Analysis, Ratio Curves

Magnitude of Accidents.—In the year 1911 in the United States, 13,625 lives were lost through industrial accidents. These deaths, coupled with other injuries to persons, represent an annual waste, according to conservative estimates of the American Red Cross, of at least $250,000,000. This large sum does not include millions paid out in accident compensation, surgical care, loss of wages, nor the subsequent decrease in efficiency of the injured. Some industries, notably mining operations, exact in this country a heavy toll in fatal and serious accidents. In the tabulation compiled by Albert H. Fay for metal mines for the year 1912, given in the text, it will be noted that for every 1,000 employees in copper mines, there is a yearly death rate from accidents of 4.62. If this ratio were maintained in our large manufacturing organizations, a factory employing 5,000 would lose yearly 23 people. In reality, where such a manufacturing organization has three fatal accidents a year, the management feels that it is a bad

Injuries and Fatalities in Certain Groups of Metal Mines in the United States

	Number of employees considered	Deaths	Death rate per 1,000	Serious injuries	Serious injuries per 1,000	Slight injuries	Slight injuries per 1,000	Ratio of fatal accidents per 1,000	
								Above surface	Under surface
Copper mines	51,776	239	4.62	1,807	34.90	11,830	228.48	3.79	4.93
Gold and miscellaneous metal mines	44,144	176	3.99	613	13.89	3,180	72.04	2.26	4.69
Iron mines	45,746	172	3.76	1,800	39.35	8,707	190.33	1.90	5.07
Lead and zinc mines	14,332	54	3.77	147	10.26	1,849	129.01	1.70	4.44
Miscellaneous metal mines	13,201	20	1.52	135	10.23	666	50.45		
Accidents by states	169,199	661	3.91	4,502	26.61	26,232	155.04	2 .35	4.74

From *Technical Paper* No. 61, "Metal-mine Accidents in the United States During the Calendar year 1912," by Albert H. Fay.

Date 191

Note:- Place employee's number visiting Emergency Hospital in Proper Column.

Foreman	Subsequent Dressing	New Medical Case	New Minor Surgical Case	Old Surgical Case	Character of New Case	Remarks
Total						

Daily hospital record.

COMPARISON, BY YEARS, OF THE NUMBER OF MEN EMPLOYED IN THE METAL MINES OF THE PRINCIPAL COUNTRIES, SHOWING THE FATALITY RATE PER 1,000 PERSONS EMPLOYED[a]

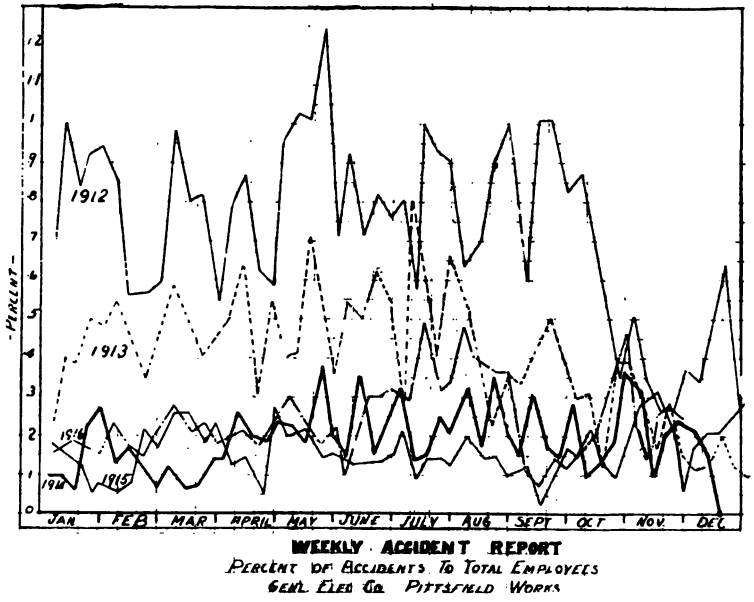
Country	1906			1907			1908			1909			1910			1911			1912		
	Number employed	Number killed	Number killed per 1,000 employed	Number employed	Number killed	Number killed per 1,000 employed	Number employed	Number killed	Number killed per 1,000 employed	Number employed	Number killed	Number killed per 1,000 employed	Number employed	Number killed	Number killed per 1,000 employed	Number employed	Number killed	Number killed per 1,000 employed	Number employed	Number killed	Number killed per 1,000 employed
Australasia:																					
New South Wales	27,347	29	1.06	26,402	24	0.91	20,881	32	1.53	17,836	20	1.12	19,369	29	1.50	19,360	35	1.81	19,807	31	71.5
New Zealand	8,716	14	1.61	9,389	7	40.75	8,880	15	1.69	7,651	14	1.83	8,121	15	1.85	7,400	5	0.68	.....	..	....
Queensland	16,273	22	1.35	15,416	13	0.84	13,759	29	2.11	12,050	26	2.16	12,342	18	1.46	11,091	10	0.90	10,608	26	245.
Tasmania[b]	7,004	4	0.57	7,516	6	0.80	6,464	6	0.93	6,054	6	0.99	5,770	8	1.39	5,247	4	0.76	5,566	53	9...
Victoria	25,304	25	0.99	23,291	27	1.16	20,853	19	0.91	18,671	15	0.80	16,553	12	0.72	14,051	19	1.35	11,856	16	1..5
Western Australia	16,608	39	2.35	16,058	42	2.62	16,075	40	2.49	17,027	33	1.94	16,279	27	1.66	15,428	36	2.33	13,700	35	2...
Austria	20,238	14	0.69	20,411	21	1.03	20,235	10	0.49	19,582	19	0.97	19,621	16	0.82	.....	...	....	.....	...	..5.
France	20,646	51	2.47	24,197	55	2.27	24,179	51	2.11	24,436	73	2.99	27,183	86	3.16	.....	...	....	.....	...	..23
Germany	95,212	119	1.25	98,441	155	1.57	97,062	115	1.18	93,928	91	0.97	93,645	141	1.51	.....	...	....	.....	...	.553
Great Britain[c]	30,231	36	1.19	31,602	34	1.08	29,927	37	1.24	28,437	40	1.41	28,676	43	1.50	29,025	43	1.48	28,058	43	1.5.
Greece	11,003	17	1.55	11,720	23	1.96	.....	...	....	8,389	13	1.55	6,933	9	1.30	.....	...	....	.....	...	....
Italy	62,558	91	1.45	59,597	113	1.90	.....	...	....	52,648	69	1.31	49,995	59	1.18	.....	...	....	.....	...	....
Japan	81,333	203	2.50	85,663	113	1.32	75,590	70	0.93	81,312	138	1.70	84,728	118	1.39	80,896	142	1.76	.....	...	....
Mexico[d]	72,023	302	4.19	92,421	479	5.18	85,107	395	4.64	81,438	471	5.78	.....	...	....	.....	...	....	.....	...	....
Peru[d]	13,961	...	....	16,936	...	.....	17,349	40	2.31	17,580	21	1.19	20,410	118	5.78	.....	...	....	.....	...	....
Portugal	4,673	2	0.43	3,928	10	2.55	6,991	9	1.29	7,858	11	1.40	6,554	11	1.68	7,484	10	1.34	.....	...	....
Russia	180,031	133	0.74	194,916	155	0.80	191,334	178	0.93	.....	...	....	.....	...	....	.....	...	....	.....	...	....
Spain[e]	118,201	272	2.30	131,943	304	2.30	120,872	275	2.28	121,866	282	2.31	126,423	256	2.02	120,781	180	1.49	.....	...	....
Sweden[f]	14,767	18	1.22	14,204	...	.....	14,628	16	1.09	13,238	16	1.21	13,775	...	....	.....	...	....	.....	...	....
Transvaal	155,317	878	5.65	168,991	805	4.76	181,637	761	4.19	192,038	1,018	5.30	205,687	882	4.29	225,538	934	4.14	.....	...	....
United States	.....	...	....	.....	...	....	.....	...	....	.....	...	....	.....	...	....	165,979	695	4.19	169,199	661	3.91

[a] Compiled from official reports.
[b] Figures for mines in Tasmania also cover coal mines and smelting works. The high rate for 1912 is due to one disastrous mine fire.
[c] Figures cover only mines coming under the "Metalliferous Mines Regulation Act."
[d] Figures also cover coal mines.
[e] Figures also cover coal mines in which about 25,000 men are employed annually.
[f] Figures also cover coal mines and quarries.

—Data compiled by A. H. Fay.

record. It will be noted from Mr. Fay's paper, that the danger underground in mining is much greater than on the surface. In foreign countries more progress, as pointed out by Mr. Fay, has been made in the reduction of mine accidents, although in a few places the records are little better than in this country.

It is possible to reduce accidents, as is shown in the experience of many industries where energetic safety work has been instituted.



Progress in accident prevention—Pittsfield Works, General Electric Co.

"Conservative statistics show that from 66 to 76 per cent. of all accidents are avoidable."

DR. M. J. SHIELDS, M. R. C., U. S. Army Field Representative, American Red Cross.

"On the Northwestern Railroad, by coöperation of the trainmen, we have reduced the fatal accidents to trainmen, in twenty months, 50 per cent."

R. C. RICHARDS, *Chairman* Central Safety Committee, Chicago and Northwestern Railroad.

"We can see the possibilities of accident prevention when we note that the Pennsylvania Railroad in ten months decreased the serious injuries of its 33,242 employees over 63 per cent., by the installation of safety devices and instruction of workmen in exercising due caution. As the result of the 'safety campaign' the United States Steel Company has reduced serious and fatal accidents in its various plants by 43.2 per cent. since 1906. The normal monthly payroll is 200,000 employees. *Each year* 2,300 *men escape who would have been injured under the previous conditions.* More men are killed by falling off ladders, scaffolding, etc., than in any other way."

J. KIRBY, JR., *President* National Association of Manufacturers.

"Of the seventy employees of the Northwestern Company killed last year, only three out of the seventy were killed in derailments and collisions and of the 5,907 employees that were injured on the Northwestern Railroad during that year, only 158 of them were injured in collisions or derailments, so it was apparent to us as it must be to you, that the accidents we desire to avoid are the little accidents. The little things that happen every day to the men that are jumping on pilots of engines, to the men that are stumbling over obstructions that they may perhaps have left there when they pulled a drawbar out of a car the night before, and the overhead obstructions, and the nails projecting from planks and boards through our yards and shops, and the one hundred and one things all over the railroad; and these were the kinds of accidents we undertook to put a stop to in the first place, believing that if we could stop the men getting hurt in little ways and gradually inculcate in them the spirit of thoughtfulness or carefulness and pull out by the root that old careless habit that we railroad people have been forming for the last fifty years, we could put an end to the accidents generally, and the big accidents would take care of themselves. And gradually we are doing this. As I said before, we have the best body of 50,000 railroad men that ever drew breath."

R. C. Richards, *Chairman* Central Safety Committee, Chicago and Northwestern Railroad.

Accident Report of the Southern Pacific Company

American Museum of Safety Competition for

HARRIMAN SAFETY MEDAL

Returns for the Southern Pacific Company R. R. (Pacific System) for year ending June 30, 1913

ACCIDENTS IN TRAIN SERVICE

Total Locomotive Miles Run, 47,153,760

	Number		Number per million locomotive miles run	
	Killed	Injured	Killed	Injured
Casualties in train accidents:				
Passengers	.....	25	.....	0.53
Employees	8	87	0.161	1.85
Other persons (not trespassing)	.....	.....	.....	.....
Total	8	112	0.161	2.38
Casualties in other than train accidents (excluding industrial accidents):				
Passengers	7	83	0.148	1.76
Employees	40	622	0.848	13.19
Other persons (not trespassing)	29	175	0.615	3.71
Total	76	880	1.611	18.66

INDUSTRIAL ACCIDENTS

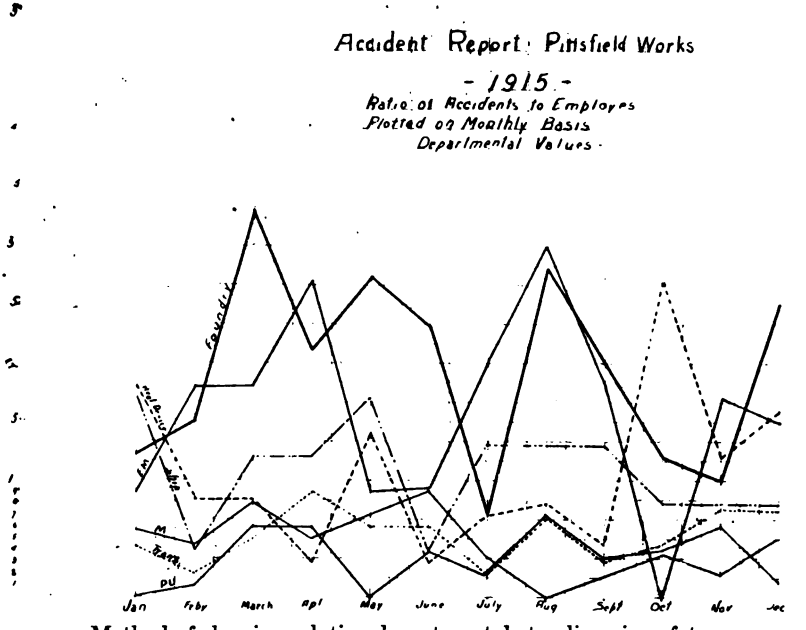
(Not involving movement of engines or cars)

Total Number of "Industrial" Employees, 30,692

	Number		Number per 1,000 employees	
	Killed	Injured	Killed	Injured
Total casualties to employees	15	1,935	0.49	63.05

From these statistics it will be seen that the loss of life from industrial accidents in the United States is very heavy. It will also be noted in such places where safety measures have been actively introduced that considerable progress has been made toward their reduction.

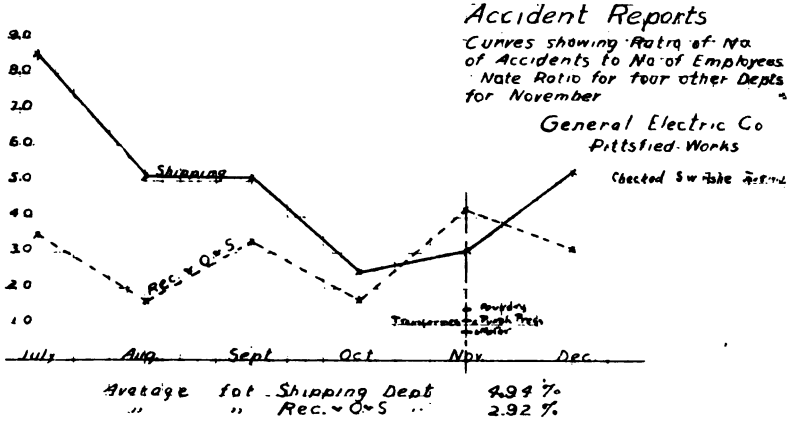
Records, Analysis, Ratio Curves.—In instituting any accident prevention campaign or any system of first aid



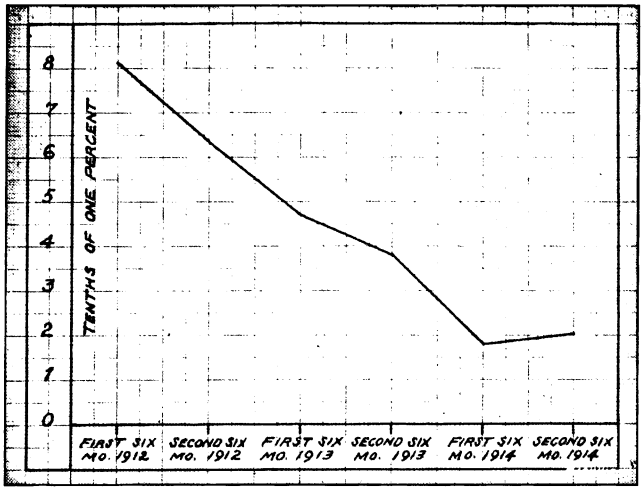
Method of showing relative departmental standings in safety.

to the injured, it is important to have a proper system of records and instructions. These records should give a history of each individual accident case, including the name, clock number, foreman, character of injury, probable duration of hurt, extent of area affected, age. Subsequent records should give the cost of the injury, how the accident occurred, whether the injury was due to carelessness, act of fellow-workmen, or absence of safeguard. Emergency hospital records in use at the Pittsfield works of the General Electric Company are shown in the text. One figure gives the individual detail on what might be

termed major accidents, or those involving a loss in time of five hours or more. Another shows a daily record, including every case which comes to the hospital. Besides the individual records and daily records, weekly summary



Method used to indicate departments not up to standard in safety work.



Showing average monthly records of accidents—Pittsfield Works.

records, shown in text, may be prepared showing the distribution of sickness, major or minor accidents, welfare trips. Each month the accident ratios for individual

.....191...
Mr. .....Building.....
Please forward to Employment Bureau report of accident.....
.....Check No. .....
Age.....Married or single..... No. Children.....
Dependent adults.....Result of injury.....
.....
.....
Injury to bones.....Area of burnt epidermis.....
Injury to tendons.....Time of dressing at hospital.....
Injury to eyesight.....Where taken after first treatment.....
Injury to hearing.....
Loss of any part of injured member.....
Probable period of disablement.....
.....
.....
.....
Welfare Nurse.

Individual accident report—Pittsfield Works.

departments, as shown, may be computed, indicating a relative safety standing of the different departments. These records may be distributed to the different foremen and also posted on bulletin boards or published in a works' employees' paper. The number of accidents per week or per month over the number of employees forms the ratios. Where an average accident curve, for the whole plant, is being prepared it is desirable to compute the ratios weekly, but where departmental comparisons are being made, a monthly ratio is better. The departmental curves will show the relative standing of the various departments and will usually indicate new fields of endeavor. Usually one will form very definite opinions as to where the greatest number of accidents should occur and where the greatest effort should be concentrated; and it becomes quite a revelation when one finds some department, such as the shipping department as shown in curve, with a greater ratio than the foundry. It is also important with the daily emergency hospital charts shown, to keep an accurate record of every case, no matter how minor, which enters the hospital. Occasionally where an employee has taken out individual

Report for Individual Accidents, Involving Lost Time, Major Accidents
MONTHLY ACCIDENT RATIOS
Pittsfield Works, General Electric Company

Department	3 months, per cent. accidents	Per cent. accidents, January	Per cent. accidents, February	March		Per cent.
				Average number employed	Number accidents	
Regulator Assembly	0.0	0.0	0.0	69	0	0.0
Moulded Insulation	0.0	0.0	0.0	47	0	0.0
Apprentice	0.0	0.0	0.0	49	0	0.0
Boiler and Blacksmith	0.0	0.0	0.0	29	0	0.0
Motor	0.25	0.31	0.31	724	1	0.14
Tool Room and Design	0.36	0.53	0.54	190	0	0.0
Punch Press	0.38	0.0	0.60	186	1	0.54
Machine Shop	0.41	0.61	0.61	169	0	0.0
Order, Stores, Receiving and Truck	0.45	0.0	0.90	228	1	0.44
Large Transformer	0.46	1.00	0.38	266	0	0.0
Building and Maintenance	0.51	0.48	0.56	208	1	0.48
Carpenter and Pattern	0.70	0.0	1.00	92	1	1.09
Small Transformer	0.74	0.71	1.16	275	1	0.36
Heating Device	0.75	0.78	0.78	293	2	0.68
Lightning Arrester	0.78	0.0	1.35	200	2	1.00
Power, Heat and Light	0.80	2.30	0.0	45	0.0	0.0
Screw Machine	0.87	2.60	0.0	75	0.0	0.0
Foundry	0.94	0.92	0.93	314	3	0.96
Testing	0.98	0.70	1.46	130	1	0.77
Tank Welding	1.01	0.0	0.0	33	1	3.04
Wire Covering	1.30	0.0	1.95	51	1	1.95
Shipping and Boxing	1.65	1.70	3.24	165	0	0.0
Equipment and Maintenance	1.89	3.70	0.0	152	3	1.98
Laboratory	1.97	5.90	0.0	35	0	0.0
Watchmen and Gatemen	2.35	9.0	3.60	29	1	3.45
Miscellaneous, includes: Engineering, Drafting, Factory Foremen, Office Payroll Clerks and Stenographers.	0.12	0.37	0.0	802	0	0.0

Total averages	January	February	March
Total employees	4,895	4,743	4,856
Total accidents	33	32	20
Per cent. accidents to total employees	0.675	0.675	0.412

Monthly Accident Comparisons

casualty insurance, claims will be made as a result of minor accidents, and proper records facilitate locating the data relative to the injury. In the State of Massachusetts it is necessary to report to the State Industrial Accident Board all accidents which involve a loss of over five hours in time.

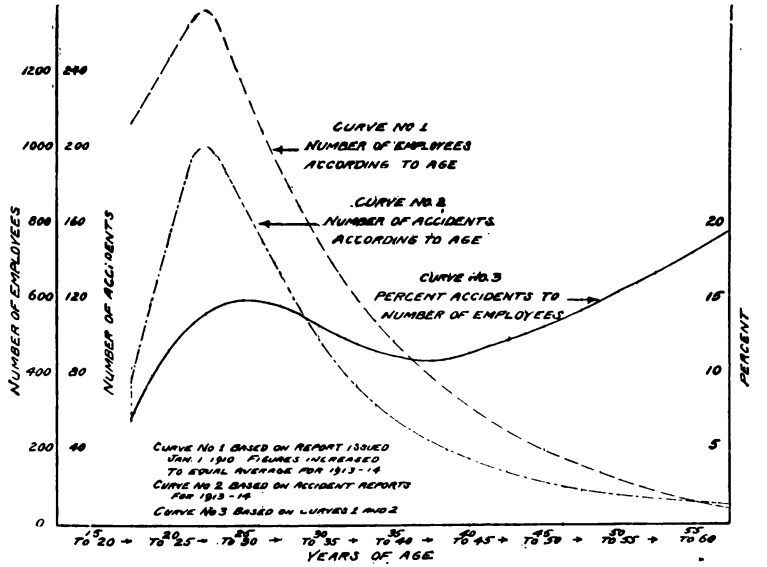
Some companies in Massachusetts go farther than this in reporting all cases of electrical shock, all cases in which there is a possibility of infection and all cases in which it is necessary to seek aid outside of the emergency service, whether or not a loss of five hours is incurred.

Importance of Minor Accidents.—All accidents reported to the State may be termed major accidents and all acci-

Visiting nurse—U. S. Steel Corp.

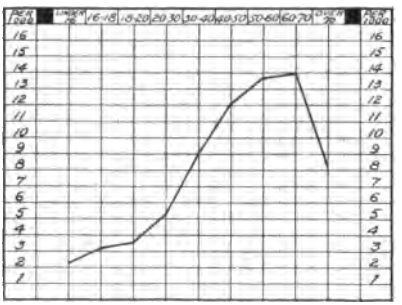
dents not reported may be termed minor accidents. The laws in different States vary somewhat regarding the reporting of accidents. Under minor accidents would be included cases with particles of dust in the eyes which are quickly removed, the individual returning to work; cases where a small cut or a small scratch occurs, the patient coming to the hospital to have the cut treated, bandaged,

returning to work, the cut being healed in a few days. It is important to insist on all cases, no matter how minor,



Liability of accident with reference to age—General Electric Company, Pittsfield Works.

coming to the hospital or dispensary for examination, for record, and for re-dressing. Where first aid jars and

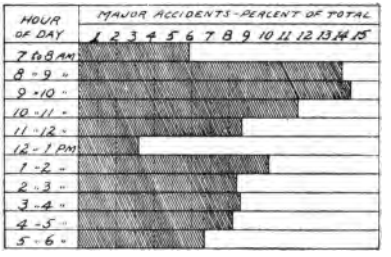


Liability in Germany—Schwedtman and Emery.

emergency cabinets are used there is a natural tendency to disregard this rule and it is only by strict discipline that this rule can be enforced. Nail punctures in particular are

quite likely to form septic wounds if not properly cared for; see Chapter IV for detailed treatment. Out of thousands of cases treated at the emergency hospital at Pittsfield, it is seldom that wounds subsequently become seriously infected. On the other hand, there occur many cases of infected wounds among those who neglect to come to the hospital for immediate treatment. The following data given by Dr. William O'Neil Sherman of the Carnegie Steel Works show what has been done to reduce infection by prompt reporting of cases.

"To give you an idea of the value of first aid properly administered, I will say that during the past three years we have been able to reduce the number of infected cases from 5.75 per cent. to 0.01 per cent. or slightly over 1 in 1,000 cases. The infected cases take three and one-half times as long to recover as the non-infected cases. The number of amputations and incisions and stiff joints resulting from infected cases is very great, while in the non-infected cases it is reduced to a minimum.



Time of day accidents occur.

The economic gain must be apparent to everyone when the loss of time, expense of treating the cases, together with the resulting permanent disability, are taken into consideration. The primary object of first aid is to furnish an aseptic or clean dressing that will prevent infection of the wound. Its further activities are to supervise the removal of the injured to the home or hospital, and to render appropriate assistance in cases of shock, heat exhaustion, gas poisoning, freezing, etc.

"A perusal of reports reveals the fact that 8,000 foreign bodies have been removed from the eyes by doctors and nurses of the company without one complication resulting to an employee. The old-time practice of unskilled fellow-employees removing cinders and particles of steel from the eye should be strongly condemned, as it is frequently followed by serious complications—even to the loss of sight.

"Welfare or social service nursing: The result of this experiment has been productive of so much good that in a short time we hope to have one or more of these workers in all the large plants. There is no one who can do so much real good and who is in closer touch with the real needs and wants of the people than the trained welfare nurse."

CHAPTER VI

Accident Relationships

General.—Labor turnover, age of employees, the time of day, form of industry, diversity of population, seasons, character of work, fatigue, production, bad lighting, weather conditions, worry, environment, all have a bearing on accidents. With the accident data available at present, it is almost impossible to form an accurate measure of the effect of these variables on accidents. The following comments are simply the writer's observations after several years' study of this matter, covering many thousand major and minor accidents. These data should not be taken as conclusive but should simply be used as suggestive.

Diversity of Population.—There prevails a general impression that the greatest tendency to accidents in any company is found in those departments made up largely of foreign help. This has not been the writer's experience. Where the subject has been investigated and an attempt made to train foreigners in safety work, it will be found that they learn quickly, are responsive, are accustomed to obeying orders, are careful, are interested and give excellent coöperation when they know of the dangers and how to avoid them. The difficulty, however, with foreign labor is that this class of labor is continually shifting; and when as an example, in a period of three months, 600 foundry employees have been completely trained in safety methods, the work will have to be repeated during the following year due to the shifting of this labor.

In a country like Germany with its military discipline, the natural interest in educational work which its people possess, the extensive safeguarding and study of improved sanitary conditions, which is going on continually, the steady temperament of the people, the system with which

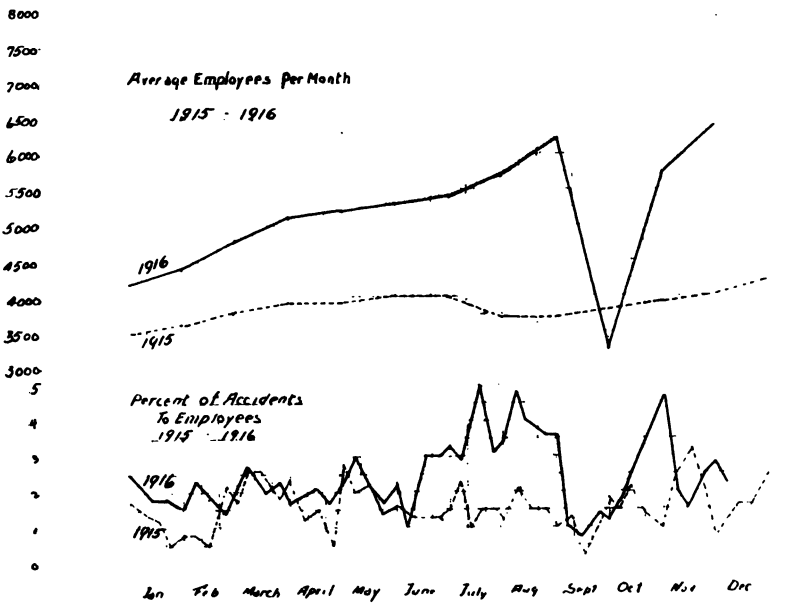
detail operations are carried on, and in the fact that in any given community the people are of the same nationality, we find accident prevention at its best. On the other hand, in America, in industries where many types of nationalities are represented, the problem becomes one of using interpreters, demonstrations, and moving pictures, to educate these people in safety; but devoting in addition, through schools, playgrounds, Boy Scout movements, a large share of time to training Young America in safety first methods. The following editorial from the *Pittsfield Daily Eagle* commenting on a series of lectures on first aid given in the Pittsfield schools, discusses this feature in an interesting way.

"Mr. ——— has the right idea, slow as many of us are to perceive it. In education he believes in beginning at the bottom and working up. In our mental attic somewhere is a saying that if you train the child in the way he should go, in after years he will not depart from it. The time to teach the boy safety is when he is young. The trouble is, he seldom hears much about it until he has reached what we call, by custom, the age of discretion. Humans are the most careless beings alive. They never look where they are going. It is necessary to have a sign at every manhole and to maintain a policeman in front of every plate-glass window. Manufacturers have to spend fortunes for safety. Men not only are temporarily indifferent—they actually vote to maintain some of the greatest elements of danger the world has ever seen! They do not seem to flee from danger. They court it and clasp it to their hearts and fondle it. Mr. ——— aims to 'open the eyes of the blind and also to broaden the gaze of those who already see.' His lectures will do great good."

Age of Employee.—Here again we find in the matter of the age of the employee a decided difference between conditions in this country and abroad. The lower curve on page 120 shows conditions among German industrial works, emphasizing the fact that abroad, the greatest tendency to accidents exists when employees are between the ages of fifty and sixty years. Contrast this curve with the upper one shown, covering conditions in a factory in America employing 5,000 employees, and it will be noticed that the tendency to accidents of young men from twenty-

two to twenty-six is as great as the tendency at fifty years. The best safety habits are found among workers approximately thirty-seven years of age.

Time Accidents Occur.—The tabulation on page 121 indicates the time of day that accidents occurred most frequently. It will be noticed that from nine to ten o'clock in the morning, the tendency is greatest. In a set of curves, compiled by Schwedtman and Emery, covering German conditions, it was indicated that from nine to twelve in the



Showing effects of labor turnover on accidents.

morning and from three to six in the afternoon, the tendency is greatest. This curve indicates that when a man comes to work in the morning it takes a little while for him to reach his maximum efficiency and when he is working at his maximum output, his tendency to get injured is greatest. Our experience at Pittsfield has also shown that in the early morning from five to six o'clock, when a man has been working all night, his bodily fatigue is great and he is extremely prone to accidents. Regarding the day

of the week, Monday seems to be the worst day in America, probably due to the tendency of most Americans to overeat, to oversleep, and generally to break all regular habits on Sunday. Abroad, Monday and Saturday seem to be the worst days.

Labor Turnover.—Labor turnover has an important bearing on accident prevention. Where many new employees are hired, the problem of quickly training these men in safety work is difficult. Some companies give rule books to new employees and insist on their studying them. In other places, foremen make a point of having someone instruct all new employees in safety. We have found the latter half of the noon hour a good time to go into the departments and talk to the men. Charts, diagrams, exhibits, first aid demonstrations may be used in this manner. Where good lecture-room facilities are available, lantern slides and moving pictures may be used during the noon hour. The best way, however, is to make a study of labor turnover and use every means possible to reduce it. As it costs about $35 to hire a new employee, in addition to training him in safety work it is well worth while to make a continuous study of labor conditions and fit employees to their proper tasks. Some companies who have made a careful study of labor turnover problems have obtained unusually good results.

Good Health.—Some companies, such as the Eastman Kodak Company, realize the bearing of good health in reducing accidents. This company issues some very cleverly illustrated booklets to its employees on right living. The Norton Emery Wheel Company through Dr. Irving Clark has also published some interesting material. The National Cash Register Company, the Sears, Roebuck Company, the International Harvester Company, give special assistance in dental work and in providing at cost glasses to correct vision. The work of the Mutual Benefit Associations in relieving employees from worry in case of sickness, and in detecting cases of tuberculosis in its early stages, has also its bearing on accident prevention. Ex-

tensive investigation carried on by Dr. Louis I. Dublin, statistician of the Metropolitan Life Insurance Company, indicates that splendid progress has been made in the reduction of diseases of children and in contagious diseases, but that the degenerative diseases of middle life are on the increase. In three years from 1911 to 1914 the infectious diseases of children, such as measles, scarlet fever, whooping cough and diphtheria, were decreased 18.2 per cent.; tuberculosis, all forms, for the same period showed a reduction of 9.8 per cent., and typhoid fever also declined 26.3 per cent. On the other hand, there has been a heavy increase in mortality at the advanced ages from such diseases as cancer, diabetes, apoplexy, organic heart disease, diseases of the arteries, cirrhosis of the liver and Bright's disease. Quoting Dr. Dublin, at the age of forty and over, together they form 51.2 per cent. of all deaths. From 1900 to 1910 diseases of the arteries, for instance, have increased 396.2 per cent. It is evident that there is need for extensive education in ways of right living for employees of middle life. Good health plays an important part in accident prevention and education in health work may well supplement education in safety work.

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